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NATIONAL DAM INSPECTION PROGRAM. MEADVILLE DAM (NDI NUMBER PA-0--ETC(U)
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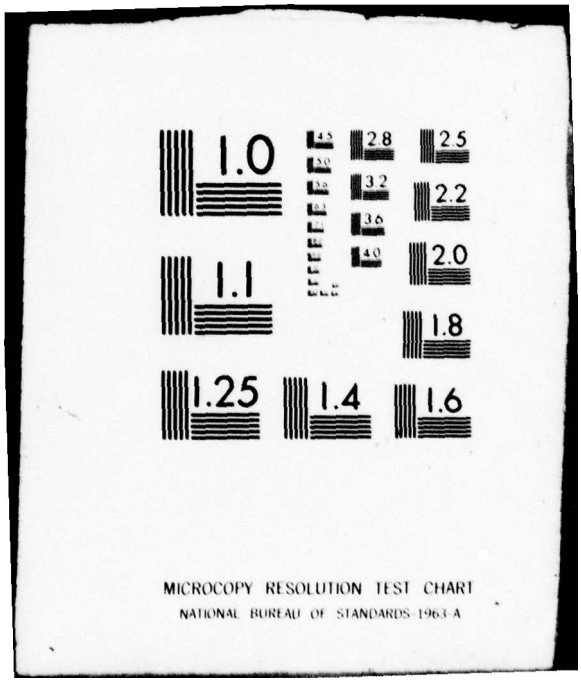
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OHIO RIVER BASIN

MEADVILLE DAM
CRAWFORD COUNTY, COMMONWEALTH OF PENNSYLVANIA
NDI No. PA 00177
PennDER No. 20-48
SCS No. PA 460

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

(6) National Dam Inspection Program. Meadville Dam (NDI Number PA-00177, PennDER Number 20-48, SCS Number PA-460), Ohio River Basin, Mill Run, Crawford County, Pennsylvania. Phase I Inspection Report,

Prepared for: DEPARTMENT OF THE ARMY
Baltimore District, Corps of Engineers
Baltimore, Maryland 21203

(12) 96p.

Prepared by: MICHAEL BAKER, JR., INC.
Consulting Engineers
4301 Dutch Ridge Road
Beaver, Pennsylvania 15009

(15) DACW31-79-C-0011

Date: (11) May 1979

(10) Chuan Yuan Chen

JOB

410 795

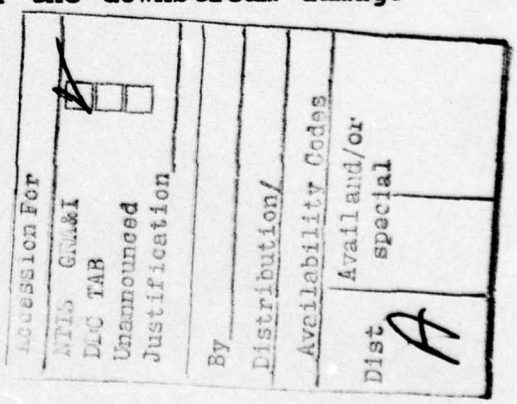
PREFACE

This report was prepared under guidance contained in the "Recommended Guidelines for Safety Inspection of Dams," for Phase I Investigations. Copies of these guidelines may be obtained from the Office of Chief of Engineers, Washington, D.C. 20314. The purpose of a Phase I Investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigation and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I Investigation; however, the investigation is intended to identify any need for such studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. In cases where the reservoir was lowered or drained prior to inspection, such action, while improving the stability and safety of the dam, removes the normal load on the structure and may obscure certain conditions which might otherwise be detectable if inspected under the normal operating environment of the structure.

It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through frequent inspections can unsafe conditions be detected and only through continued care and maintenance can these conditions be prevented or corrected.

Phase I Inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established guidelines, the spillway design flood is based on the estimated "Probable Maximum Flood" for the region (greatest reasonably possible storm runoff), or fractions thereof. The spillway design flood provides a measure of relative spillway capacity and serves as an aid in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and the downstream damage potential.



PHASE I REPORT
NATIONAL DAM INSPECTION PROGRAM

Meadville Dam, Crawford County, Pennsylvania
NDI No. PA 00177, PennDER No. 20-48, SCS No. PA 460
Mill Run
Inspected 1 December 1978

ASSESSMENT OF GENERAL CONDITIONS

Meadville Dam is a zoned earthfill dam designed by the Soil Conservation Service (SCS), U.S. Department of Agriculture. The dam has a crest length of 420 feet, a height of 40 feet, and a storage capacity of 30 acre-feet at normal pool. Meadville Dam is classified as a "High" hazard-"Intermediate" size dam.

Visual inspection and review of engineering data in December 1978 and April 1979 indicate no serious deficiencies requiring emergency attention. The dam was found to be in good overall condition at the time of inspection; however, several minor items of remedial work should be performed in the near future. These items include:

1) Repair the manually operated control for the pond drain.

2) The eroded areas should be regraded, treated and seeded with an appropriate mixture to prevent erosion.

3) The catch basin drain in the auxiliary spillway should be cleared of debris.

The owner should continue in the future to inspect the embankment and concrete appurtenances, and repair as necessary. In addition, the following operational measures are recommended to be undertaken by the owner:

1) Develop a detailed emergency operation and warning system.

2) During periods of unusually heavy rain, provide around-the-clock surveillance of the dam.

3) When warning of a storm of major proportions is given by the National Weather Service, the owner should activate the emergency operation and warning system.

Hydraulic/hydrologic evaluations, performed in accordance with procedures established by the Baltimore District, Corps of Engineers, for Phase I Inspection Reports, revealed that the spillway will pass the Probable Maximum Flood (PMF) without overtopping the dam. The spillway is therefore considered "adequate."

Submitted by:

MICHAEL BAKER, JR., INC.

C. Y. Chen

C. Y. Chen, Ph.D., P.E.
Engineering Manager-Geotechnical

Date: 25 May 1979

Approved by:

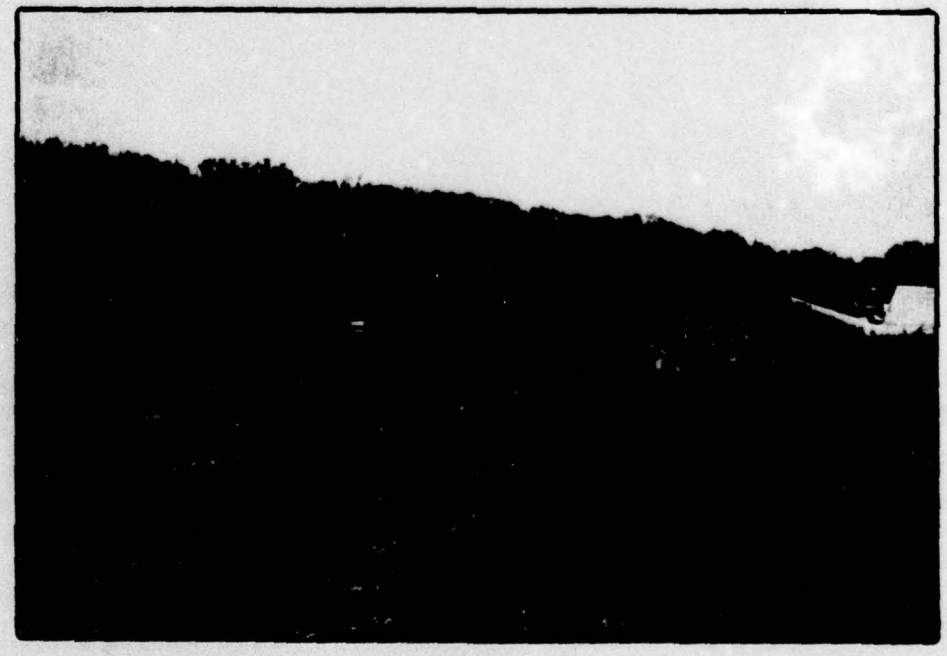
DEPARTMENT OF THE ARMY
BALTIMORE DISTRICT, CORPS OF ENGINEERS

G. K. Withers

G. K. WITHERS
Colonel, Corps of Engineers
District Engineer

Date: 14 Jun 79

Overall View of Downstream Embankment and Concrete Spillway
(Note Erosion Channel on Embankment)



Overall View of Upstream Face of Dam from Dike on East Abutment
(Note Ruts and Erosion on Face of Dam)

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PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM
MEADVILLE DAM
NDI No. PA 00177, PennDER No. 20-48, SCS No. PA 460

SECTION 1 - PROJECT INFORMATION

1.1 GENERAL

a. Authority - The Dam Inspection Act, Public Law 92-367, authorized the Secretary of the Army, through the Corps of Engineers, to initiate a program of inspection of dams throughout the United States.

b. Purpose of Inspection - The purpose of the inspection is to determine if the dam constitutes a hazard to human life or property.

1.2 DESCRIPTION OF PROJECT

a. Description of Dam and Appurtenances - Meadville Dam, locally known as Rainbow Lake, is a zoned earthfill dam with a crest height of 40 feet and an embankment length of 420 feet. The upstream face has a slope of 3H:1V (Horizontal to Vertical) with a 10-foot wide berm at El. 1164.0 feet. This berm provides access to the riser unit. The downstream face has a slope of 2H:1V. The crest of the embankment is 15 feet wide. A cutoff trench is provided in the embankment, with a minimum depth of 3 feet and a bottom width of 12 feet.

The protective dike around adjacent Meadville High School is also a zoned earthfill embankment. The upstream face near the auxiliary spillway has a slope of 3H:1V and the downstream face has a slope of 2H:1V. After a transition section at original Station 12+00, both the upstream and downstream slopes are 5H:1V. The dike has an approximate crest length of 1335 feet (excluding the auxiliary spillway).

The outlet works (principal spillway) consist of a pond drain, concrete riser unit, conduit and stilling basin. An 18-inch bituminous coated corrugated metal pipe is used as the pond drain and has an inlet at the upstream toe. Flow from the pond drain into the riser is controlled by a sluice gate which is hand-operated from the top of the riser. The crest of the riser is at El. 1163.5 feet. The conduit to the stilling basin is a 42-inch reinforced concrete water pipe placed on a concrete cradle.

A reinforced concrete weir box and concrete chute spillway is constructed in the right abutment area. The crest elevation of the overflow spillway is 1184.3 feet. The overflow spillway is 260 feet long. The channel has a width of 50 feet and a length from the upper end to the control section of 260 feet. The control section is an ogee overflow weir, 7.25 feet above the floor of the channel. The floor of the channel is 15 inches thick; the retaining walls are as high as 30 feet and are reinforced with 92 counterfort sections.

b. Location - Meadville Dam is located on Mill Run approximately 1.25 miles upstream of its confluence with French Creek and 150 feet east of Morgan Street in the city of Meadville.

c. Size Classification - The dam is 40 feet high and has a maximum storage capacity of 850 acre-feet. Therefore, the dam is in the "Intermediate" size category.

d. Hazard Classification - Due to the proximity of the city of Meadville, Pennsylvania, many lives could be lost in the event of failure of the dam. Therefore, this dam is considered in the "High" hazard category.

e. Ownership - The dam is owned by the city of Meadville, 984 Water Street, Meadville, Pennsylvania 16335.

f. Purpose of Dam - The dam was designed as a flood control structure. However, the reservoir and surrounding area are also used for recreation.

g. Design and Construction History - Meadville Dam was designed in 1962 by the U.S. Soil Conservation Service (SCS). The dam was constructed in 1963 and 1964 by Smith Construction Company.

h. Normal Operational Procedures - The dam has no formal operating procedures. Normal pool is maintained by the riser crest at El. 1163.5 feet. An 18-inch bituminous coated corrugated metal pipe connected to the pond drain, with invert El. 1157.5 feet, can be opened during periods of heavy rain to minimize flooding of recreational facilities around the dam.

1.3 PERTINENT DATA

a. Drainage Area (square miles) - 7.96

b. Discharge at Dam Site (c.f.s.) -

Maximum Flow -	Unknown
Ungated Spillway Capacity at Maximum Pool Elevation (El. 1189.5 ft.) -	10,100

c. Elevation [feet above Mean Sea Level (M.S.L.] -

Minimum Top of Dam -	1189.5
Design Top of Dam -	1189.8
Maximum Pool -	1189.5
Normal Pool -	1163.5
Streambed at Centerline of Dam -	1150

d. Reservoir (miles) -

Length of Maximum Pool -	0.8
Length of Normal Pool -	0.2

e. Storage (acre-feet) -

At Normal Pool (El. 1163.5 ft.) -	30
At Maximum Pool (El. 1184.3 ft.) -	471
At Top of Dam (El. 1189.5 ft.) -	850

f. Reservoir Surface (acres) -

Top of Dam (El. 1189.5 ft.) -	74.0±
Normal Pool (El. 1163.5 ft.) -	4.0

g. Dam -

Type -	Zoned earthfill
Length (feet) -	420
Height (feet) -	40
Top Width (feet) -	15
Slopes - Upstream - (with 10-foot berm at El. 1164.0 ft.)	3H:1V
Downstream -	2H:1V

Zoning - The embankment is constructed of three zones -- the core section consists of impervious fill made up of clays and silty clays, the downstream zone is mixed sand and gravel, and the upstream zone contains more pervious material composed of sands and gravels.

Impervious Core - Clay and silty clay

Cutoff - The cutoff trench is in the embankment foundation. The trench was excavated to a minimum depth of 3 feet and has a 12-foot bottom width. The bottom of the cutoff trench rests on impermeable glacial till.

Grout Curtain -	None
Dike -	Zoned embankment

h. Diversion and Regulating Tunnel (Principal Spillway) -

Type - Drop Inlet with 42 inch reinforced concrete water pipe placed on a concrete cradle. Five anti-seepage collars are provided along the pipe at intervals of 24 feet.

Length of Conduit (feet) -	175.33
Access - Through top of concrete riser	
Weir Elevation (feet M.S.L.) -	1163.5
Weir Size (feet) (four Inlets) -	4 by 3.5

i. Spillway (Auxiliary Spillway) -

Type - Reinforced concrete weir box and chute channel spillway	
Width of Channel (feet) -	50
Crest Elevation (feet M.S.L.) -	1184.3
Gates -	None
Upstream Channel (Length in feet) - (from upper end to the control section)	288

Downstream Channel - Final 28-foot section is level at El. 1159.3 feet. The control section is an ogee overflow weir, 7.25 feet above the floor of the channel. The channel discharges into a 50-foot-wide grass-lined channel.

j. Regulating Outlets - Manually operated 18-inch sluice gate located at bottom of riser.

SECTION 2 - ENGINEERING DATA

2.1 DESIGN

Available design data which were considered necessary for a Phase I Investigation of Meadville Dam were furnished by the Pennsylvania Department of Environmental Resources (PennDER) from File No. 20-48. The file included:

1) Operation and maintenance reports from the SCS.

2) Several letters of correspondence between the SCS and the city of Meadville.

3) Photographs taken during the construction of Meadville Dam.

4) Permits for construction.

5) Hydrologic/hydraulic calculations for the dam performed by SCS personnel.

6) Quantity calculations of the dam and appurtenances computed by SCS personnel.

7) A complete set of design drawings for the dam and appurtenances.

2.2 CONSTRUCTION

The dam was constructed by the Smith Construction Company in 1963 and 1964. No progress reports concerning the status of construction were available in PennDER's files. However, some correspondence including photographs and in-place density test results were included.

2.3 OPERATION

The city of Meadville, owner of the dam, is responsible for all operation and maintenance.

2.4 EVALUATION

a. Availability - PennDER File No. 20-48 contained a full set of design drawings for the Meadville Dam.

b. Adequacy - The information available is generally adequate for a Phase I Inspection.

c. Validity - There is no reason at the present time to believe that the available engineering data is inaccurate or misleading.

SECTION 3 - VISUAL INSPECTION

3.1 FINDINGS

a. General - The inspection was made on 1 December 1978. No unusual weather conditions were experienced and the lake was at normal pool. The dam and appurtenant structures were found, in general, to be in good overall condition at the time of inspection. The problems noted during the visual inspection are considered minor and do not require immediate remedial treatment. Noteworthy deficiencies observed are described briefly in the following paragraphs. The complete visual inspection check list and field sketches are given in Appendix A.

b. Dam - Along the dike south of the auxiliary spillway, vehicular traffic has caused rutting along the east slope and crest. Pedestrian traffic has worn a pathway in the grass cover from Meadville High School east of the dike, over the dike, up the south slope of the dam, and along the crest of the dam (see field sketches for location). Erosion was also observed along the chain link fence around the auxiliary spillway. A drainage path has eroded down the slope behind the wing wall on the right side of the auxiliary spillway. A small path has also developed on the left side of the auxiliary spillway and right abutment of the dam.

On the downstream face of the embankment, a major channel has eroded approximately 100 feet from the left abutment. The channel is 2 feet wide by 1 foot deep and extends from the crest to the toe of the embankment. Two minor channels, 6 inches by 6 inches, have also eroded approximately 50 feet on either side of the larger one and typically begin 2 to 3 feet below the crest. The downstream face is covered with thick, tall vegetation.

c. Appurtenant Structures - Several erosion areas were observed around the outlet structure. The areas between the head wall and chain-link fence on both the right and left side are eroded, as is the area just outside the fence on the right side. An eroded area also was noted at the end of the wing wall on the left side. Small animal holes are located on the right side of the end of the wing wall. The concrete head wall and sandstone wing walls are in good condition.

The sluice gate control for the pond drain was not operating properly at the time of the inspection. According to information from the local personnel, the gate was last opened in the Spring of 1977 and in order to operate the gate a bolt had to be removed from down inside the riser structure. The 6-inch diameter embankment drain outlets were not visible due to the amount of water flowing from the 42-inch outlet pipe and therefore no assessment could be made of their operation. The catch basin drain in the auxiliary spillway is covered with debris.

The concrete walls along the auxiliary spillway are in good condition with the exception of some minor spalling along the outside of the south end wall. Some cracks were also noted on the walls adjacent to the spillway. The differential movement of the walls and wing walls was noted. According to the local representatives of the city of Meadville, the SCS (designer of the dam) is studying the problem. The movement was first noted in the SCS annual inspection report dated 17 May 1968.

d. Reservoir Area - No problems were observed in the reservoir area. Reservoir slopes are gently sloping to moderately steep with a good cover of grasses or stands of forests.

Approximately two miles upstream from Meadville Dam on Mill Run is Tamarack Lake Dam "A" (NDI No. PA 00177).

e. Downstream Channel - The outlet channels for the principal spillway and auxiliary spillway showed no signs of past erosion. The channel banks are gently sloping with established vegetation. The dam is located within the city of Meadville and the downstream channel (Mill Run) flows through a major portion of both the residental and business community of Meadville. It cannot be estimated how many homes or businesses might be affected by a dam failure, but more than likely it would be greater than 100. A 13 May 1956 flood which occurred prior to construction of the dam caused an appraised (1956 value) damage of $170,000. This flood was of a magnitude that is likely to occur on the average once every 40 years.

SECTION 4 - OPERATIONAL PROCEDURES

4.1 PROCEDURES

No formal operational procedures are used for Meadville Dam since it is a flood control structure and does not require the use of water supply intake valves or gates. The reservoir under normal operating conditions remains at approximate El. 1163.5 feet and has 20.8 feet of additional storage to the crest of the emergency spillway.

4.2 MAINTENANCE OF DAM

The city of Meadville has an annual inspection program for the dam assisted by the SCS. Maintenance which is normally performed on a biweekly schedule by personnel of the Department of Public Works, Parks Division, includes removal of debris, repairing eroded areas, revegetating bare spots and mowing grass.

4.3 MAINTENANCE OF OPERATING FACILITIES

The city of Meadville, Department of Public Works, Parks Division, personnel are responsible for maintenance of the riser. The park superintendent visits the dam during heavy rainfall to check the trash rack and check for flow over the auxiliary spillway.

4.4 DESCRIPTION OF ANY WARNING SYSTEM IN EFFECT

At the present time, there is no warning system or evacuation plan in the event of a dam failure.

4.5 EVALUATION OF OPERATIONAL ADEQUACY

Maintenance of the operating facilities are considered adequate for the functions that they serve; however, formal records of lift gate inspections should be instituted. In addition, formal emergency procedures should be developed as recommended in paragraph 7.2.

SECTION 5 - HYDRAULIC/HYDROLOGIC

5.1 EVALUATION OF FEATURES

a. Design Data - Hydrologic and hydraulic calculations were obtained from the PennDER files. According to SCS design criteria by which Meadville Dam was designed, the emergency spillway and freeboard hydrographs were developed and routed through the reservoir to establish the elevations of the design high water and crest of dam. These hydrographs were developed by combining discharges from the north spillway of Tamarack Lake (dam site "A"), located approximately 1.7 miles upstream, as well as uncontrolled runoff from the tributary drainage area below Tamarack Lake. The results of the rainfall and hydrograph calculations used in the analysis are summarized as follows:

RAINFALL AND HYDROGRAPH CALCULATIONS

	Six-Hour Rainfall (inches)		Resulting Hydrograph Peak
Hydrograph	Tamarack Lake	Meadville Reservoir	(c.f.s.)
Emergency Spillway	8.8	9.1	6969
Freeboard	17.7	18.3	13043

The resulting elevations of the design high water and crest of dam are 1187.3 feet and 1189.8 feet, respectively.

b. Experience Data - Extensive flooding from Mill Run occurred in the city of Meadville prior to construction of the Meadville Dam. The maximum reservoir stage since construction of the dam was approximately 4 feet above normal pool. No other reservoir experience records were available for the preparation of this report.

c. Visual Observations - At the time of the inspection, no condition was observed that would indicate that the spillway and outlet works could not operate satisfactorily in the event of a flood.

d. Overtopping Potential - Meadville Dam is classified as a "High" hazard-"Intermediate" size dam requiring evaluation for a spillway design flood (SDF) equal to the Probable Maximum Flood (PMF). The outlet works and spillway consist of a concrete drop-inlet and a concrete weir box which exits into a concrete chute. The hydrologic and hydraulic capabilities of the reservoir, outlet works, and spillway were evaluated by routing the PMF through the reservoir with the aid of the U.S. Army Corps of Engineer's Flood Hydrograph Package, HEC-1. Runoff from the uncontrolled drainage basin tributary to Meadville Dam as well as outflows from Tamarack Lake (Dam "A"), were considered in the hydrologic analysis. The resulting PMF hydrograph, therefore, had a peak discharge of 5943 c.f.s. based on a 6-hour rainfall of 21.9 inches. The results of the flood routing indicate that the reservoir is capable of passing the PMF with a corresponding reservoir level of El. 1187.9 feet. This maximum reservoir stage is 1.6 feet below the actual dam crest at El. 1189.5 feet.

e. Spillway Adequacy - The dam, as outlined in the above analysis, is capable of passing the PMF without overtopping. Therefore, the spillway is classified as "adequate" according to the recommended criteria.

SECTION 6 - STRUCTURAL STABILITY

6.1 EVALUATION OF STRUCTURAL STABILITY

a. Visual Observations - No structural inadequacies were noted during the visual inspection of Meadville Dam.

b. Design and Construction Data - No construction records were avilable; however, the stability calculations contained in the design records were reviewed during the preparation of this report. The review indicates that there should be no cause for concern for the structural stability of the earth embankment or appurtenances. The embankment as designed should be sufficiently stable due to the fill height and moderate slopes of the dam. The toe or foundation drains were designed to intercept seepage through the permeable material and to control the phreatic line in the embankment. The minor differential movement of the auxiliary spillway walls was not considered severe enough to create a stability problem.

c. Operating Records - The last yearly inspection (dated 22 July 1977) conducted by the SCS and local representatives indicated the wing walls and retaining walls appear to have stabilized and no new movement could be detected.

d. Post-Construction Changes - No alterations of the dam were apparent since it was constructed.

e. Seismic Stability - Meadville Dam is in Seismic Zone 1 of the "Seismic Zone Map of the Contiguous United States," Figure 1, page D-30, "Recommended Guidelines for Safety Inspection of Dams." This is a zone of very low seismic activity. As indicated in paragraph 6.1.b., Meadville Dam could be shown to meet the static stability requirements of the "Recommended Guidelines for Safety Inspection of Dams." As a result, no further consideration of seismic stability is considered necessary under the present circumstances.

SECTION 7 - ASSESSMENT, RECOMMENDATIONS/REMEDIAL MEASURES

7.1 DAM ASSESSMENT

a. Safety - Meadville Dam is designed to prevent overtopping under conditions equal to PMF. No seepage was observed during the visual inspection when the reservoir was at normal pool. The dam was found to be in good overall condition.

b. Adequacy of Information - The information available and the observations made during the field inspection are considered sufficient for this Phase I Inspection Report.

c. Urgency - The owner should initiate the action discussed in paragraph 7.2 without delay.

d. Necessity for Additional Data/Evaluation - Since the Meadville Dam meets the requirements of the hydrologic evaluation guidelines as set forth in "Recommended Guidelines for Safety Inspection of Dams" and does not appear to have any deficiencies in its structural stability, the need for any additional investigation is not warranted.

7.2 RECOMMENDATIONS/REMEDIAL MEASURES

The inspection and review of information revealed certain items of work which should be performed in a timely manner by the owner. These include:

1) The manually operated controls for the pond drain should be repaired and maintained to ensure their proper operation.

2) The eroded areas should be regraded, fertilized and seeded with an appropriate mixture to prevent erosion.

3) The catch basin drain in the auxiliary spillway should be cleared of debris, and in the future, this task should be part of a routine maintenance schedule.

4) The location of the dam between Meadville High School and a residential area of the city of Meadville presents special problems. The heavy pedestrian traffic causes damage to the grass cover both on the dam crest and

embankment slopes. It is recommended that the owner investigate the possibility of installing a proper walkway along this route by placing gravel across the crest of the dam and a stairway on the upstream and downstream face.

5) All motor vehicles such as trail bikes and all-terrain vehicles should be strictly prohibited from the embankment. The motor vehicle traffic on the dike embankment should also be restricted.

The owner should continue in the future to inspect the embankment and concrete appurtenances, and repair as necessary.

In addition, the following operational measures are recommended to be undertaken by the owner:

1) Develop a detailed emergency operation and warning system.

2) During periods of unusually heavy rain, provide around-the-clock surveillance of the dam.

3) When warning of a storm of major proportions is given by the National Weather Service, the owner should activate the emergency operation and warning system.

PLATES

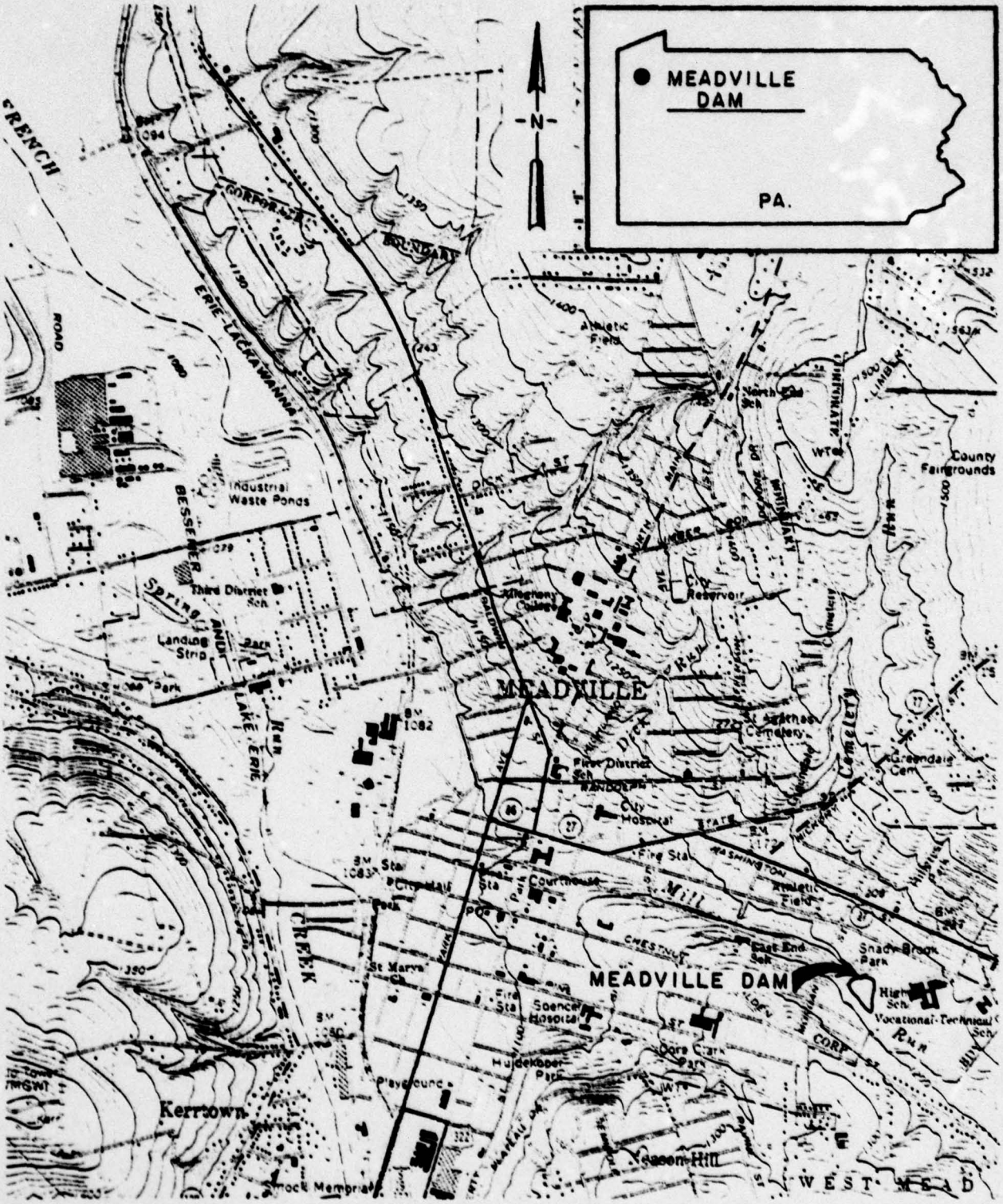
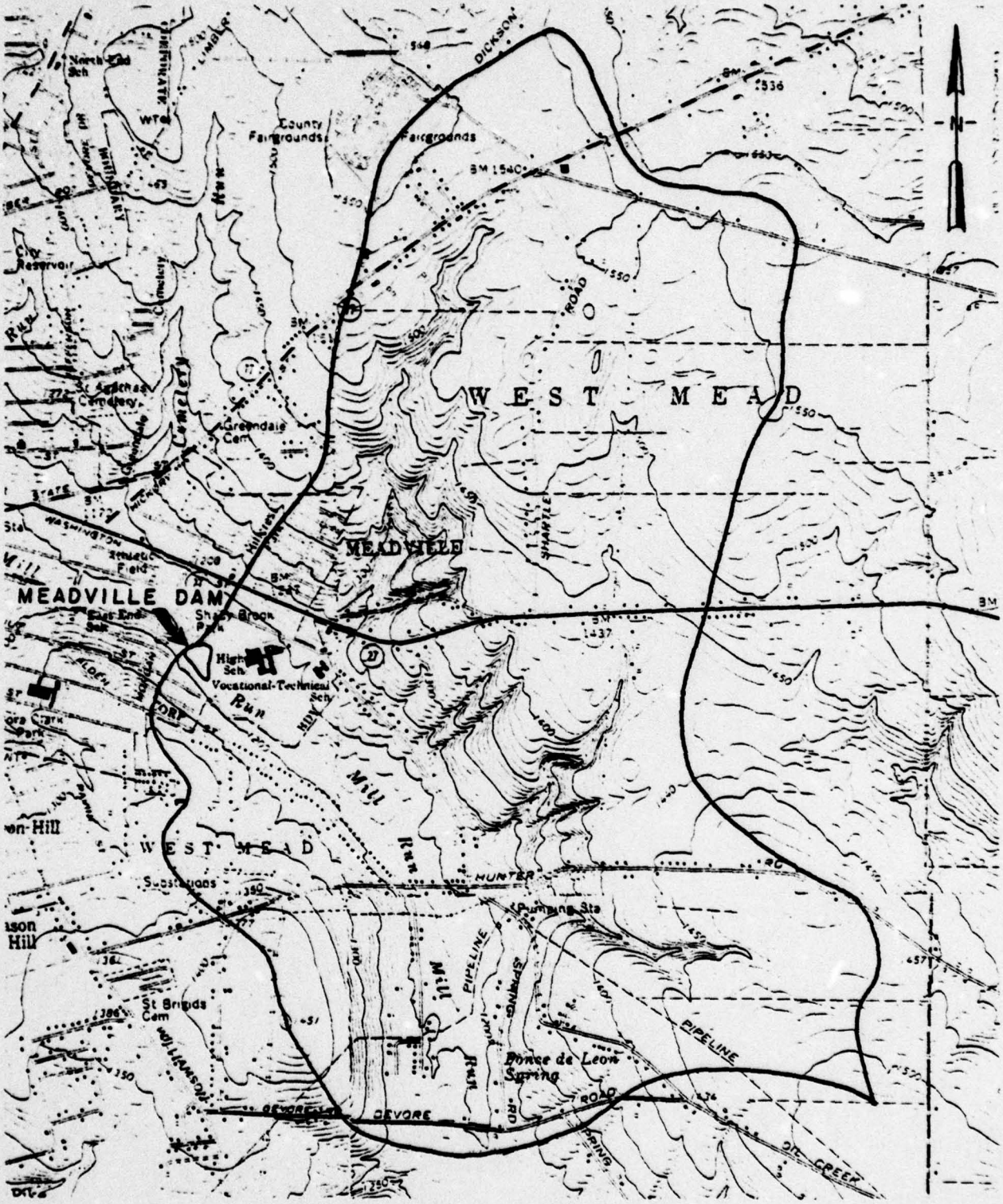


PLATE 1 LOCATION PLAN

MEADVILLE DAM



SCALE 1:24000

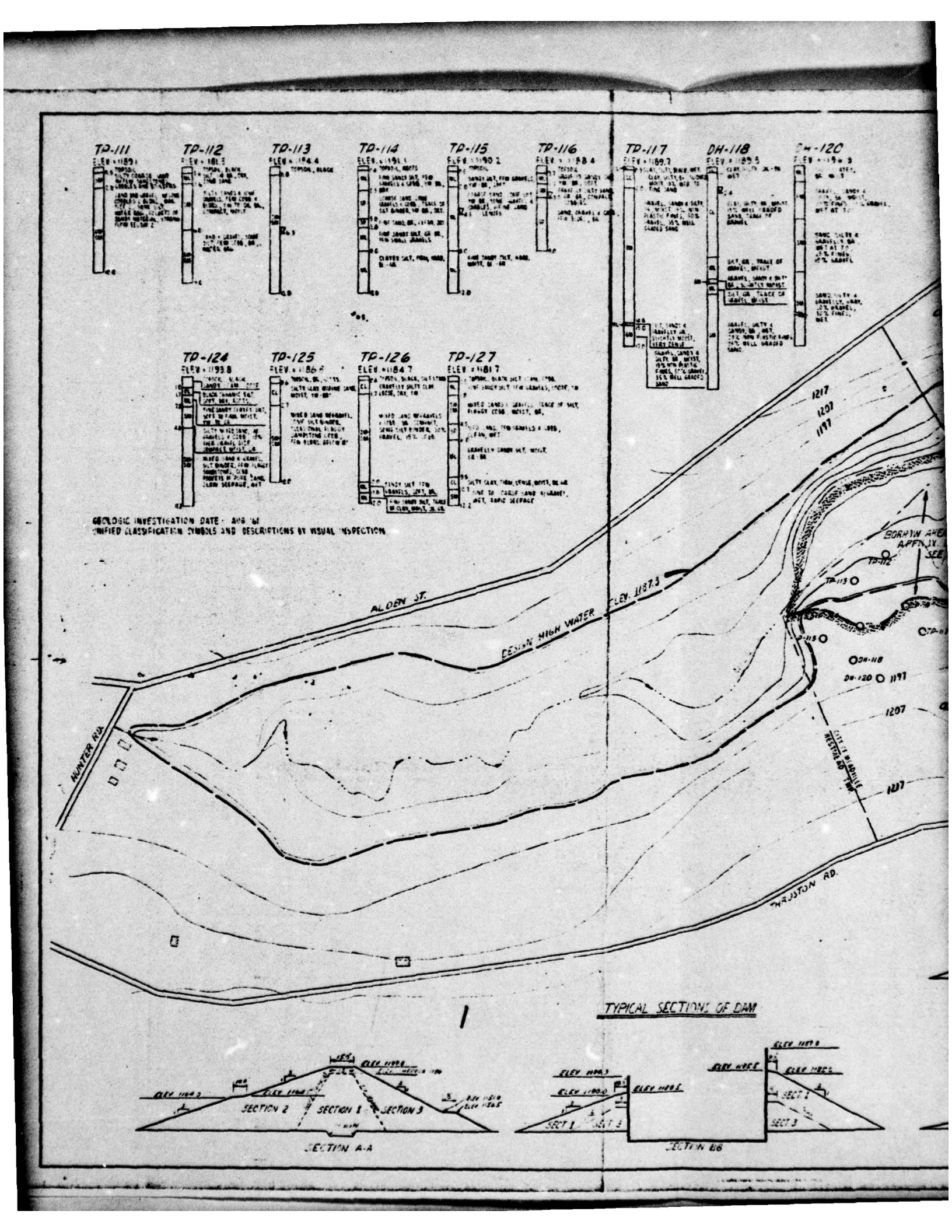
1 1/2 0 1 MILE

1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

1 5 0 1 KILOMETER

PLATE 2 WATERSHED MAP

MEADVILLE DAM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TP-112
TP-113
TP-114
TP-115
TP-116
TP-117
DH-118
DH-120
TP-124
TP-125
TP-126
TP-127
GEOLOGIC INVESTIGATION DATE: AUG '66
UNIFIED CLASSIFICATION SYMBOLS AND DESCRIPTIONS BY VISUAL INSPECTION
ALDEN ST.
DESIGN HIGH WATER ELEV. 1187.3
HUNTER RD.
THRUSTON RD.
1217
1207
1197
1237
TP-112
TP-113
TP-119
DH-118
DH-120 1197
1207
1237
TYPICAL SECTIONS OF DAM
SECTION 2
SECTION 1
SECTION 3
SECTION A-A
SECT 1
SECT 2
SECT 3
SECTION BB

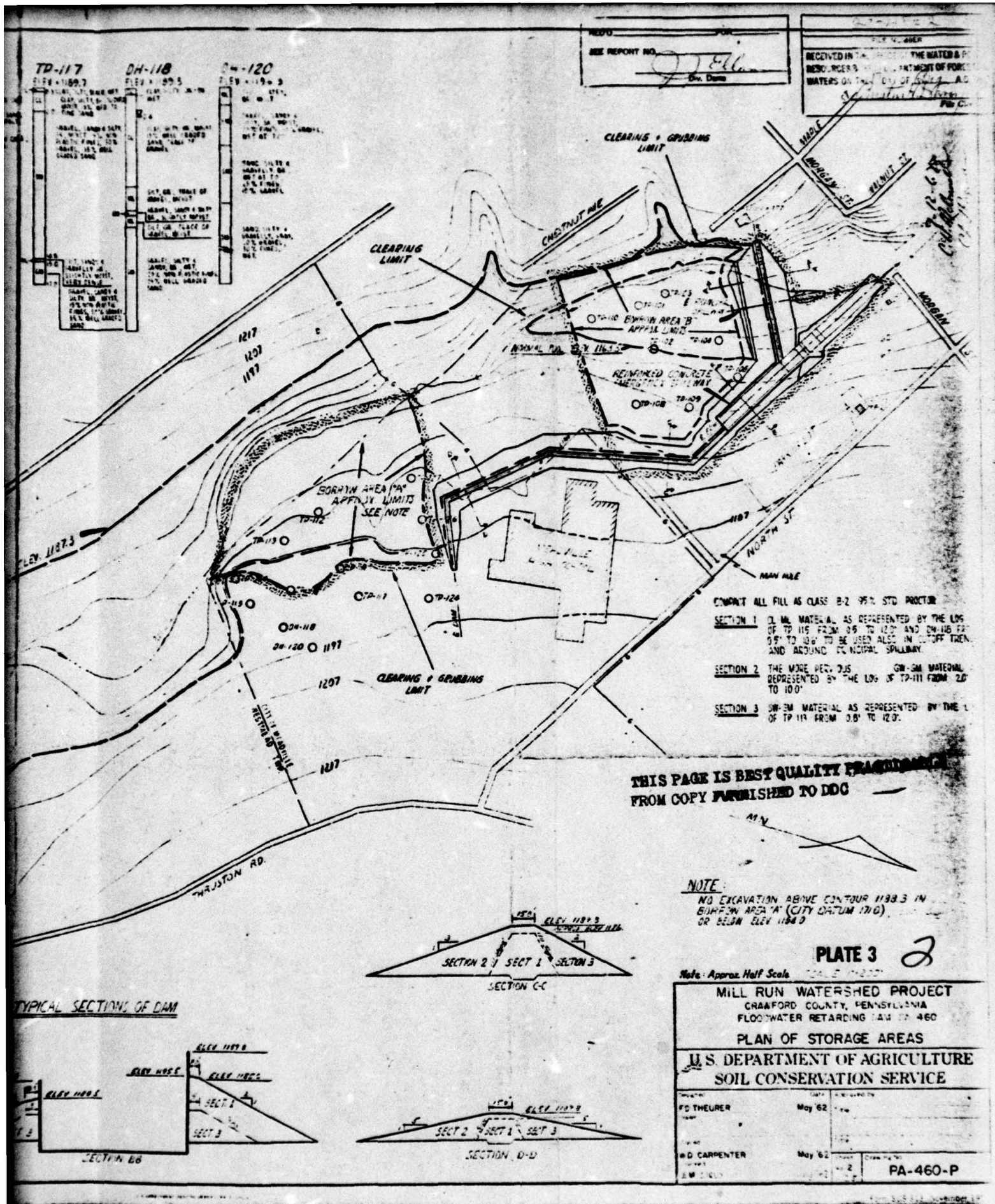


PLATE 3

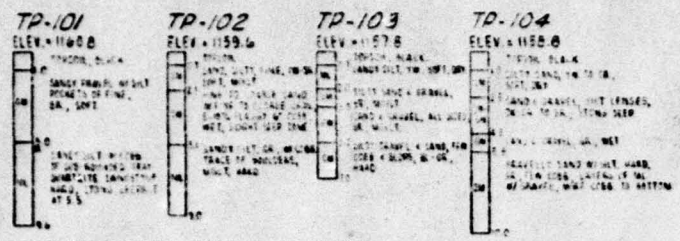
Note: Approx. Half Scale

MILL RUN WATERSHED PROJECT
CRAWFORD COUNTY, PENNSYLVANIA
FLOODWATER RETARDING DAM NO. 460

PLAN OF STORAGE AREAS

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

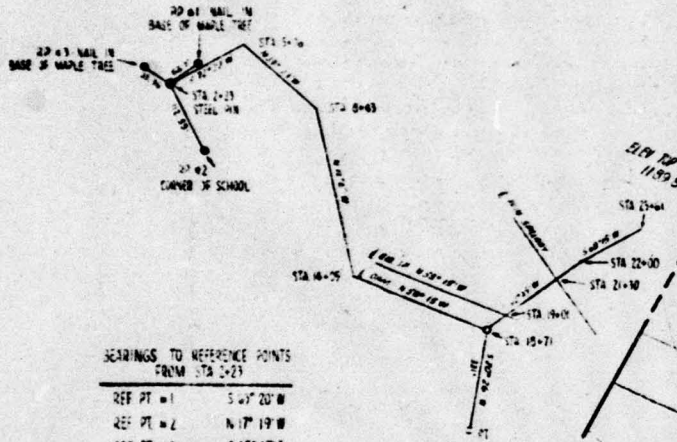
F.D. THEURER	May '62	
W.D. CARPENTER	May '62	PA-460-P



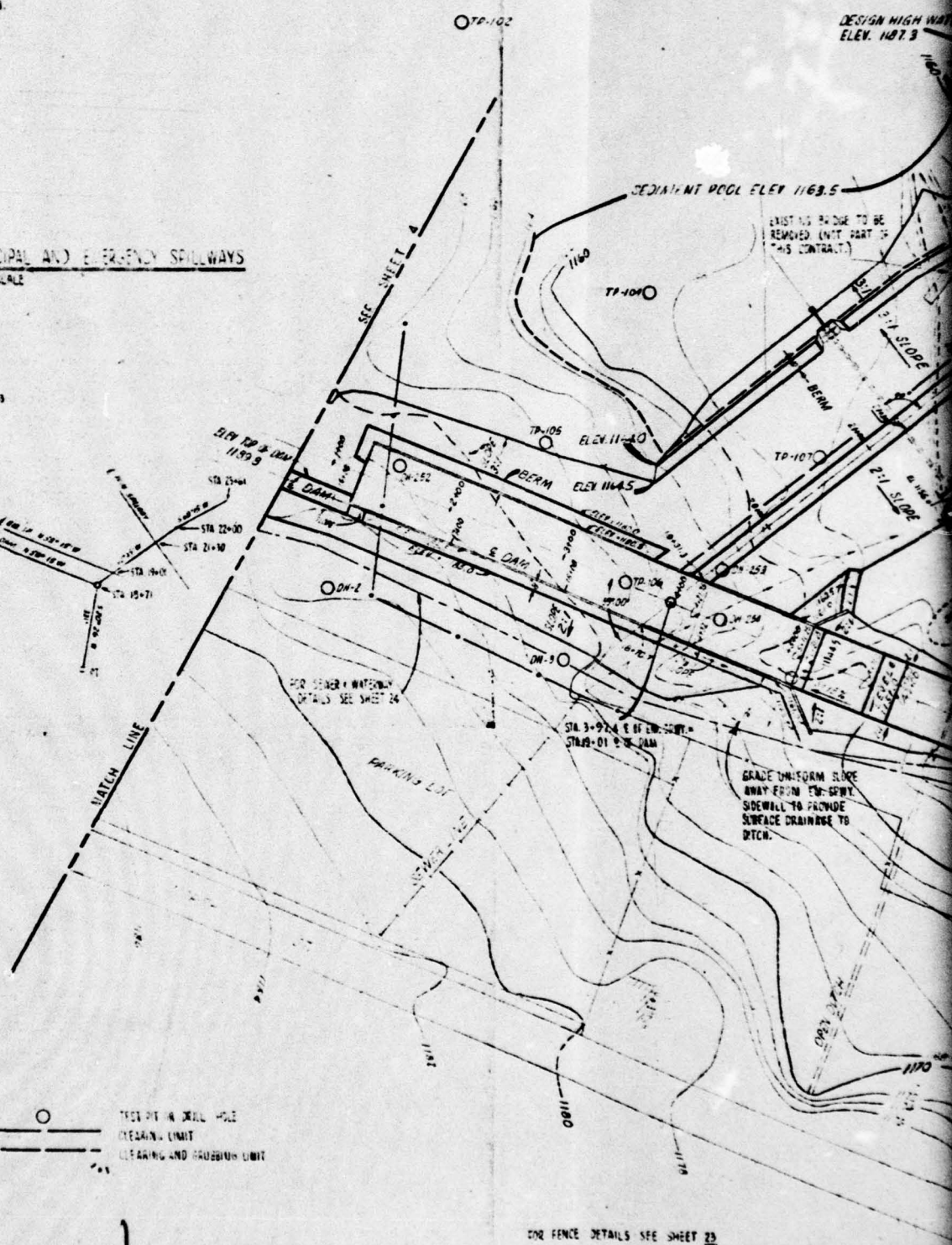
UNIFIED SOIL CLASSIFICATION SYMBOLS BY VISUAL INSPECTION.
GEOLOGIC INVESTIGATION DATE: [illegible]

LAYOUT OF CENTERLINES DAM, PRINCIPAL AND EMERGENCY SPILLWAYS

NOT TO SCALE



BEARINGS TO REFERENCE POINTS FROM STA 2+23	
REF PT #1	S 69° 20' W
REF PT #2	N 17° 19' W
REF PT #3	S 45° 47' E



LEGEND

- BUILDINGS
- CONTOUR
- ROAD
- P&L LINE
- EXISTING FENCE
- EXISTING FENCE TO BE REMOVED
- TEST PIT OR DRILL HOLE
- CLEARING LIMIT
- CLEARING AND EXCAVATION LIMIT

1

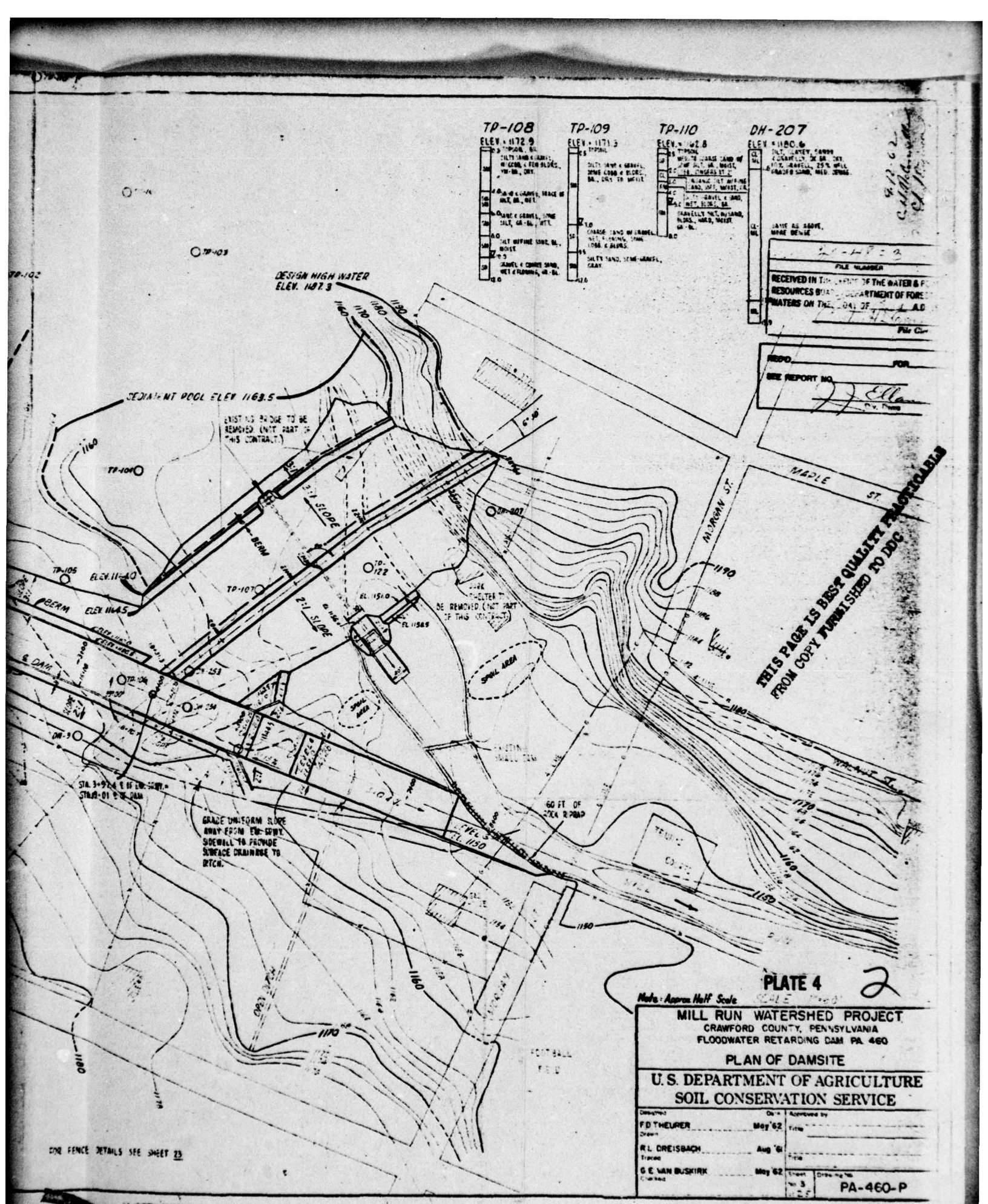


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PLATE 4

Note: Approx. Half Scale

MILL RUN WATERSHED PROJECT
CRAWFORD COUNTY, PENNSYLVANIA
FLOODWATER RETARDING DAM PA 460

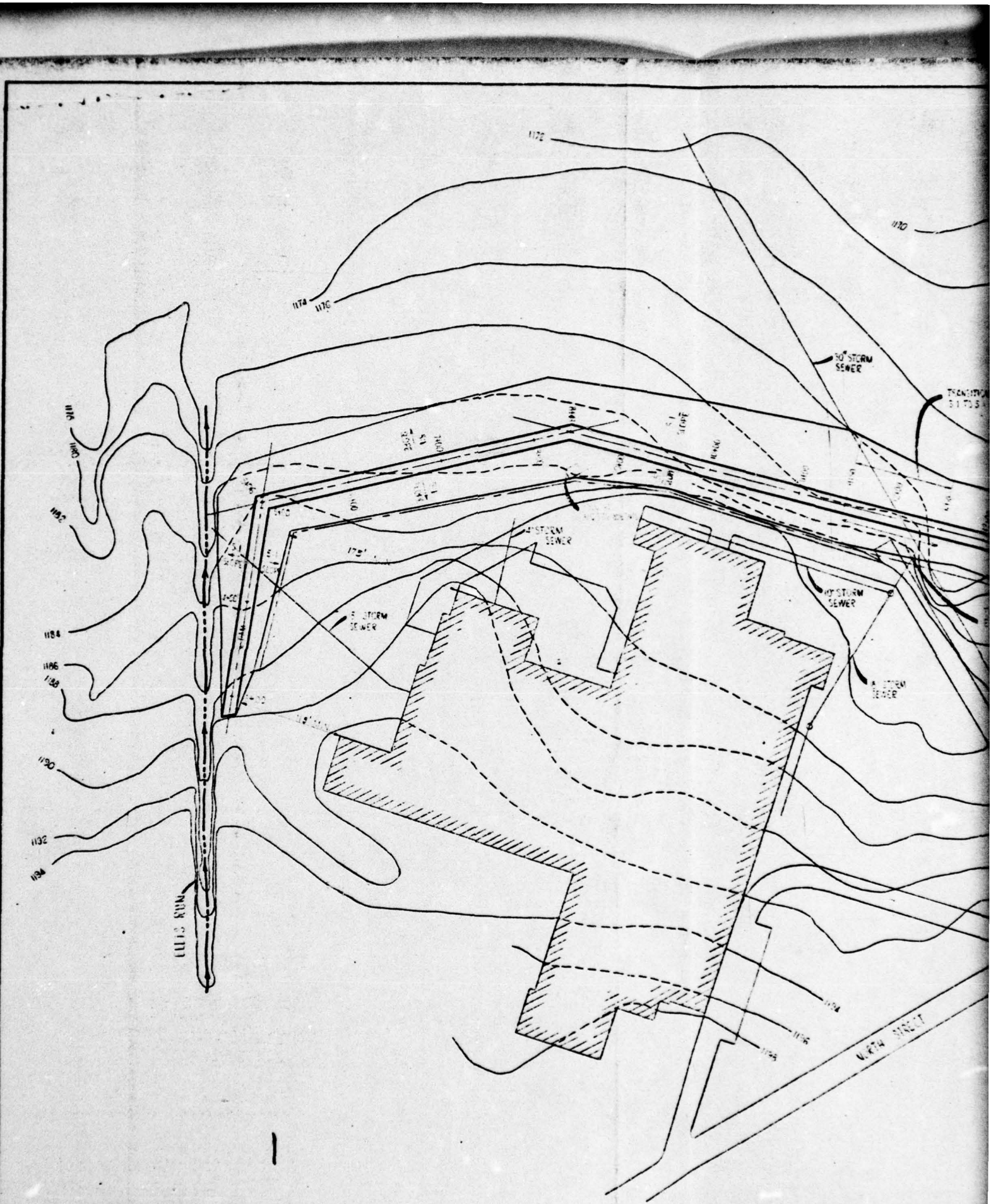
PLAN OF DAMSITE

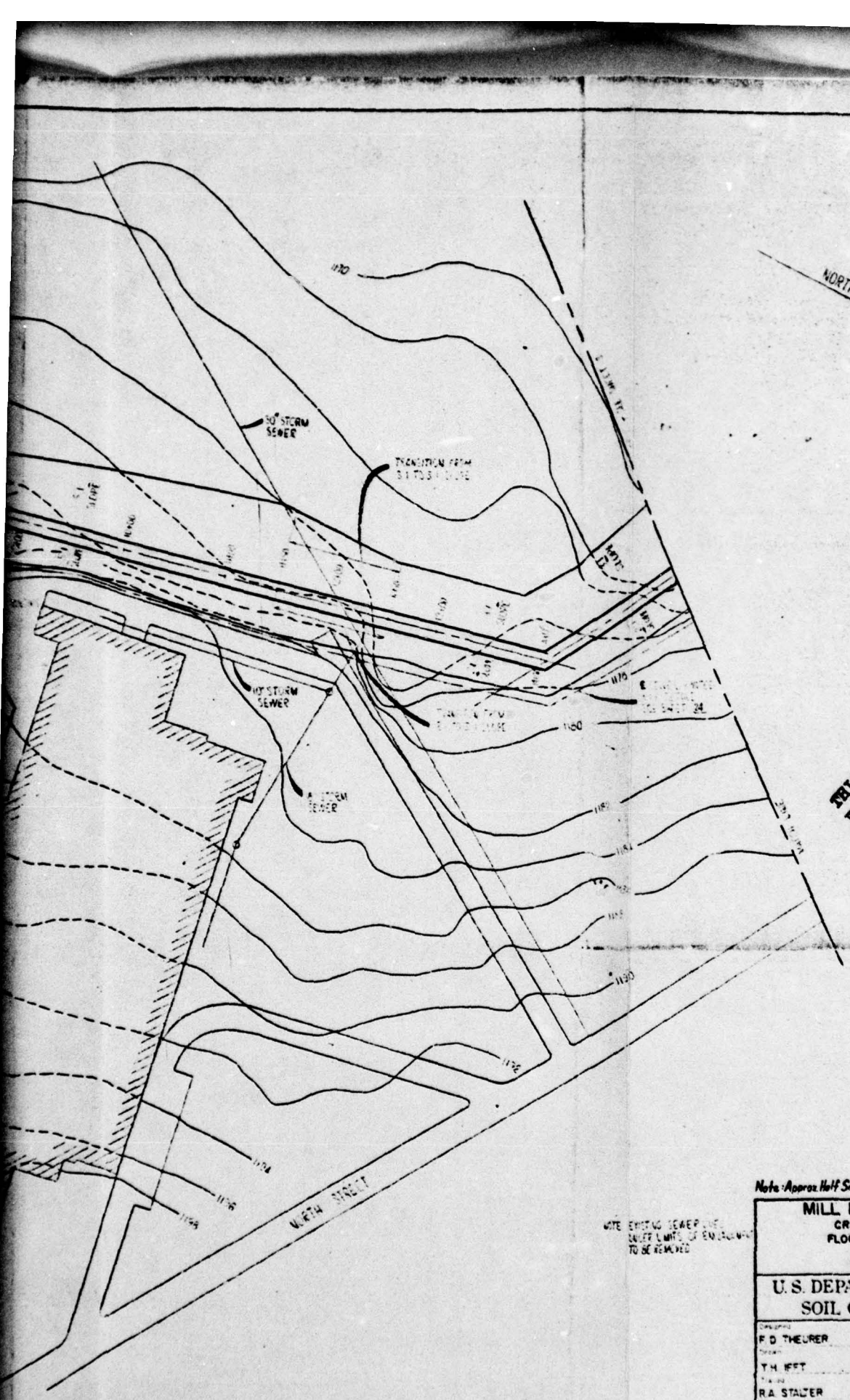
U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Designed	Date	Approved by
F.D. THEURER, Drawn	May '62	Title
R.L. DREISBACH, Traced	Aug '62	Title
G.E. VAN BUSKIRK, Checked	May '62	

Sheet No. 3 of 5 Sheets — Drawing No. PA-460-P

Form SCS-313 (November 1


1172
1170
1174
1176
30" STORM SEWER
1180
1182
1184
1186
1188
1190
1192
1194
8" STORM SEWER
10" STORM SEWER
8" STORM SEWER
8" STORM SEWER
1184
1186
1188
NORTH STREET



2

PLATE 5

Note: Approx. Half Scale

NOTE: EXISTING SEWER LINE UNDER LIMITS OF EMBANKMENT TO BE REMOVED

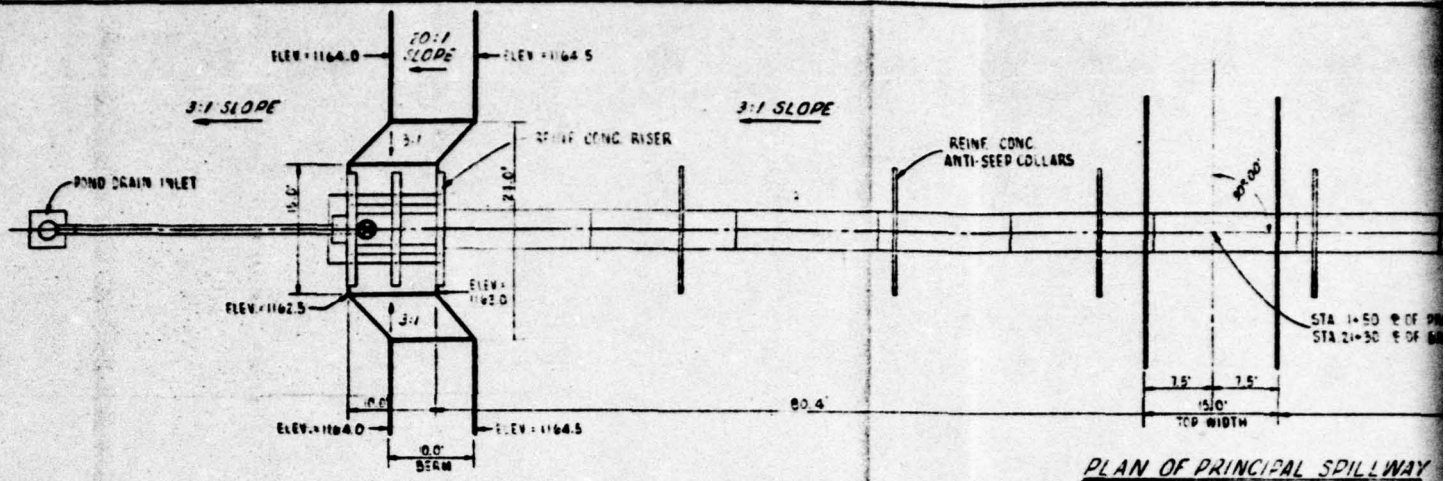
MILL RUN WATERSHED PROJECT
CRAWFORD COUNTY, PENNSYLVANIA
FLOODWATER RETARDING DAM PA-460

PLAN OF DAMSITE

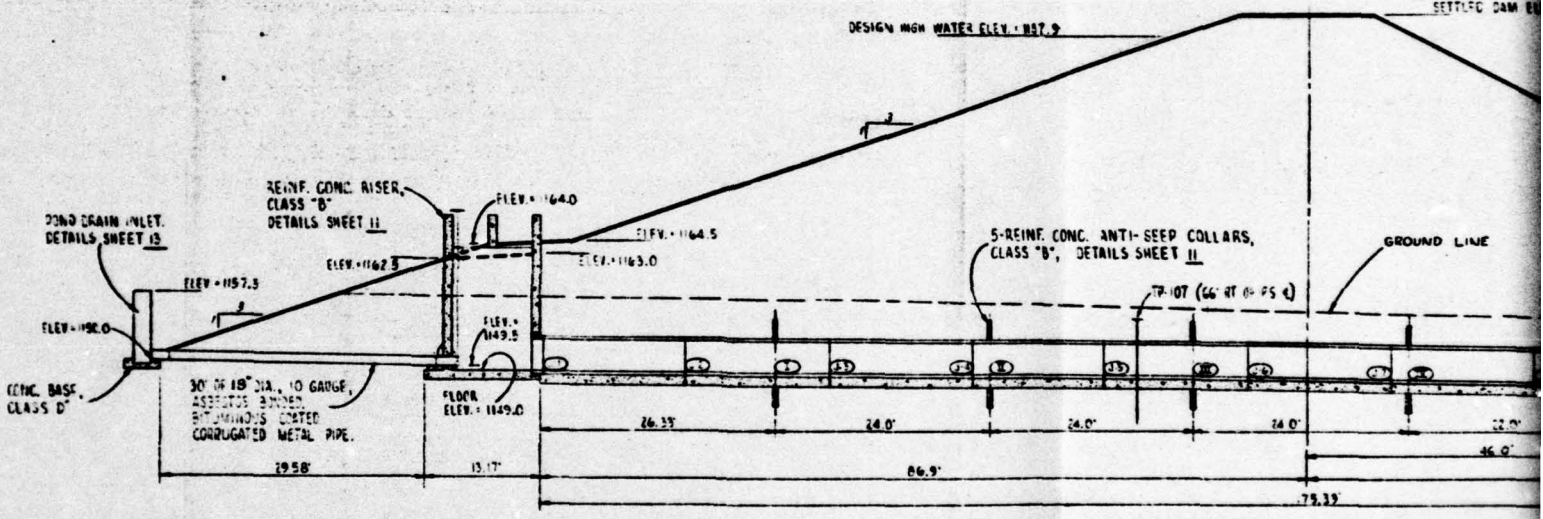
U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

F. D. THEURER	MAY '62	
T. H. IFFT	JULY '62	
R. A. STALTER	JULY '62	

4 | PA-460-P



PLAN OF PRINCIPAL SPILLWAY



PROFILE OF PRINCIPAL SPILLWA

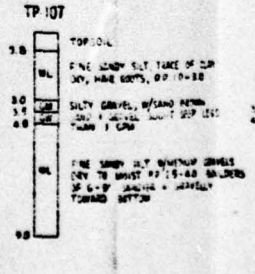
NOT TO SCALE

JOINT	DISTANCE FROM RISER	INVERT ELEV. OF 42" PIPE
J-1	0.33	1149.00
J-2	16.33	1148.92
J-3	32.33	1148.83
J-4	48.33	1148.75
J-5	64.33	1148.67
J-6	80.33	1148.58
J-7	96.33	1148.50
J-8	112.33	1148.20
J-9	128.33	1147.30
J-10	144.33	1147.60
J-11	160.33	1147.30
J-12	176.33	1147.00
I	26.39	1148.86
II	50.33	1148.74
III	74.33	1148.61
IV	98.33	1148.49
I	120.33	1148.05

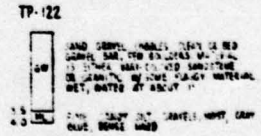
NOTE: PIPE LENGTHS ARE BASED ON NOMINAL VERTICAL AND DO NOT INCLUDE CREEP.

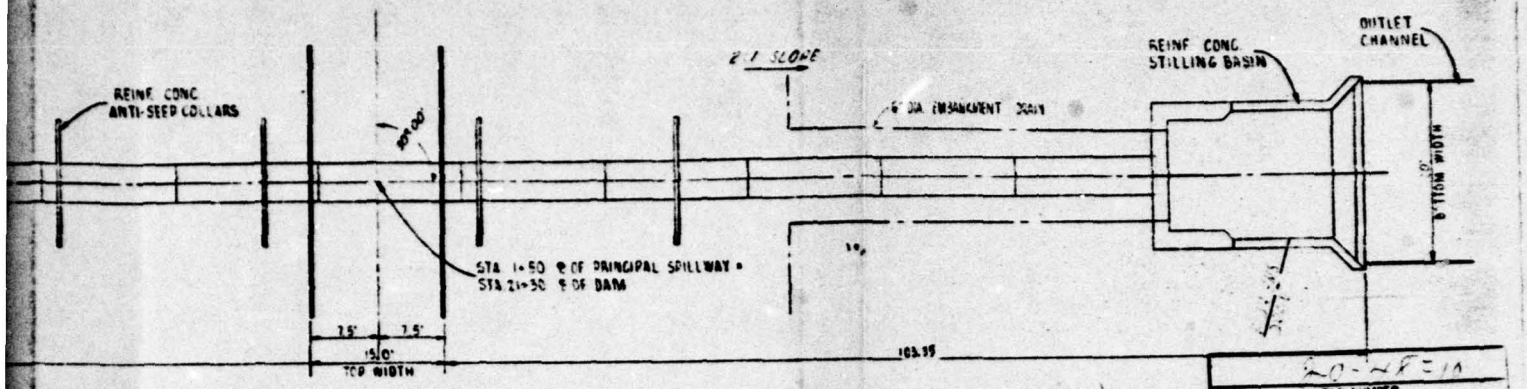
MAX CAMBER = 0.5 FT. @ JOINT J-6

TP-107



TP-122

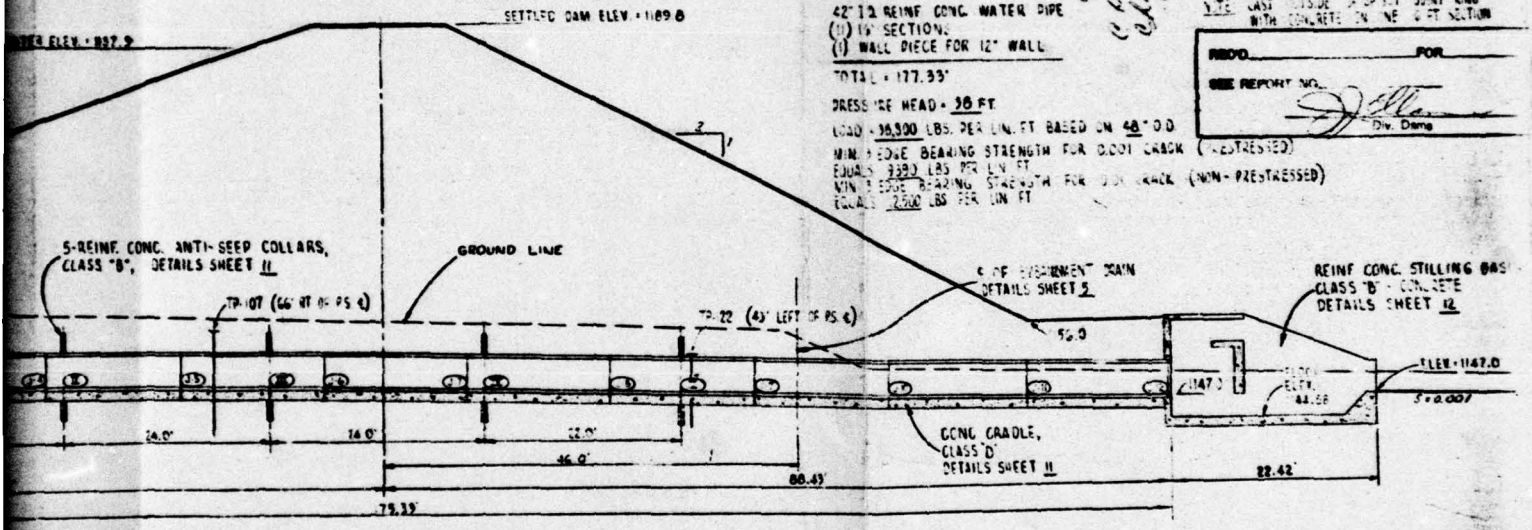




PLAN OF PRINCIPAL SPILLWAY

RECEIVED IN THE OFFICE OF THE WATER & POWER RESOURCES BOARD - DEPARTMENT OF FORESTS & WATERS ON THE ___ DAY OF ___ A.D. 19__

File Clerk



42" I.D. REINF CONC. WATER PIPE
(11) 10' SECTIONS
(1) WALL PIECE FOR 12" WALL

TOTAL = 117.33'

PRESSURE HEAD = 38 FT.

LOAD = 38,300 LBS. PER LIN. FT BASED ON 4800

MIN. EDGE BEARING STRENGTH FOR 0.01" CRACK (PRESTRESSED) EQUALS 3330 LBS PER LIN. FT.

MIN. EDGE BEARING STRENGTH FOR 0.01" CRACK (NON-PRESTRESSED) EQUALS 2,500 LBS PER LIN. FT

RECD. ___ FOR ___

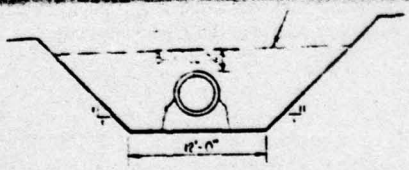
SEE REPORT NO. ___

Div. Dams

WITH LAST OUTSIDE SEGMENT JOINT SEALED WITH CONCRETE ON ONE SECTION

PROFILE OF PRINCIPAL SPILLWAY

NOT TO SCALE



TYPICAL SECTION OF PRINCIPAL SPILLWAY EXCAVATION

TP-122

THIS PAGE IS BEST QUALITY PRACTICABLE FROM COPY FURNISHED TO DDC

Note: Approx. Half Scale

PLATE 6

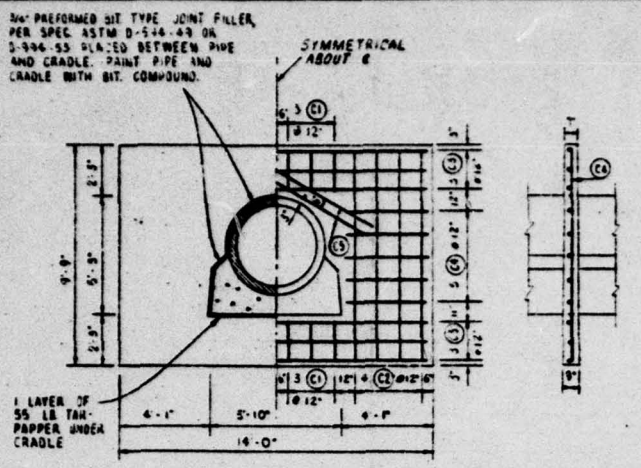
MILL RUN WATERSHED PROJECT
CRAWFORD COUNTY, PENNSYLVANIA
FLOODWATER RETARDING DAM PA 460

PLAN-PROFILE OF PRINCIPAL SPILLWAY

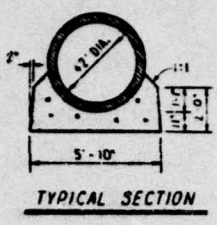
U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Designed	Date	Approved by
F.D. THEURER	May '62	Title
Drawn		
M. NIKOLICH	May '62	Title
Traced		
Checked		Sheet No. 10 of 25 sheets
W.L. HILL	May '62	Drawing No. PA-460-P

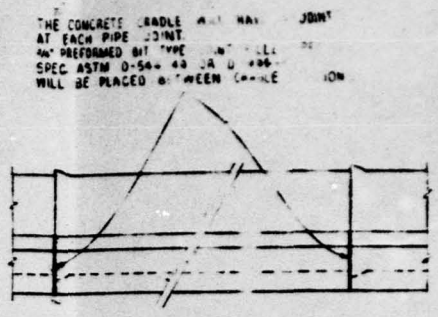
Form SCS-813 (November ...



DETAILS OF REINFORCED CONCRETE ANTI-SEEP COLLAR



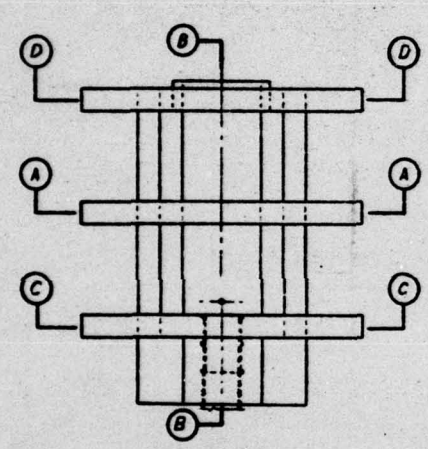
TYPICAL SECTION



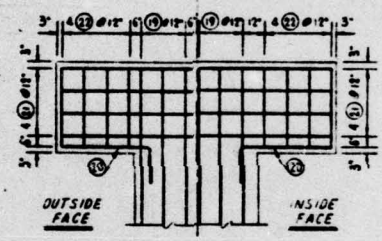
DETAILS OF CONCRETE CRADLE

SLIDE GATE NOTES:

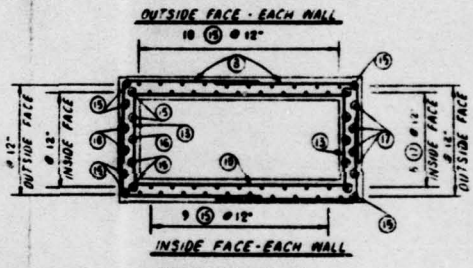
18" DIA SLUICE GATE, ROCKLEY HUNT SERIES 100 FLANGE FRAME & EQUAL
18" DIA 30' LONG FLANGE & BELL CAST IRON WALL CASTING
SEATING HEAD -0'
UNSEATING HEAD-20'
OPERATING HEAD-20'
RISING STEM - THREADED PORTION BRONZE
STEM STEM GUIDES, WALL BRACKET & HAND WHEEL SIZED & SPACED ACCORDING TO MANUFACTURERS RECOMMENDATIONS.



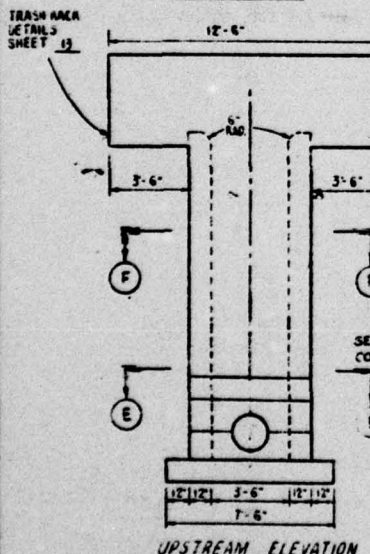
PLAN VIEW



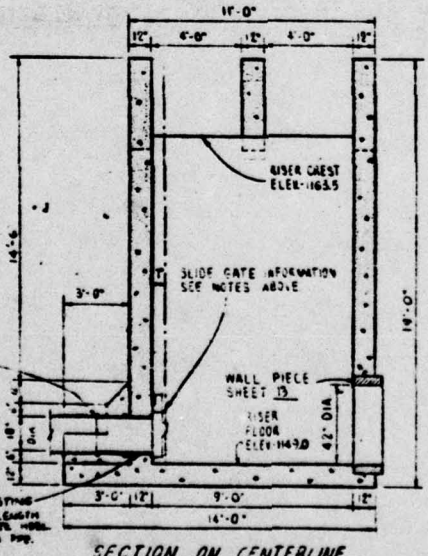
SECTIONS C-C & D-D



SECTION E-E



UPSTREAM ELEVATION



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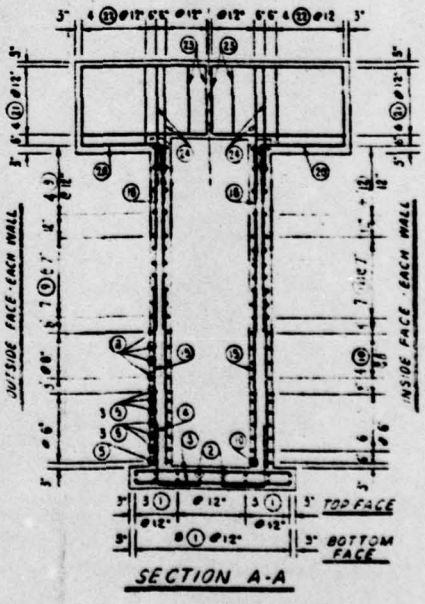
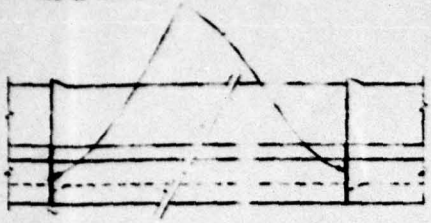


SECTION A-A

DETAILS OF REINFORCED CONCRETE RISER

THE CONCRETE CRADLE WALL MAY HAVE ... JOINT AT EACH PIPE JOINT ... PREFORMED BITUMINOUS TYPE ... SPEC. ASTM D-994-48 OR A.S.T.M. D-994-... WILL BE PLACED BETWEEN CRADLE ... CONCRETE

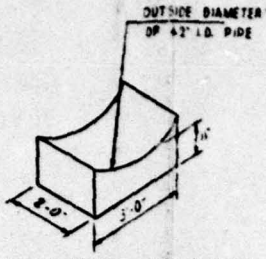


DETAILS OF CONCRETE CRADLE

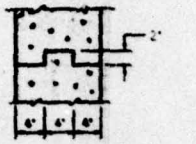
NOTES:

... VALLEY HUNT SERIES 100 FLANGE FRAME & EQUAL ... & BELL CAST IRON WALL CASTING

... GED PORTION BRONZE ... WALL BASKET & HAND WHEEL SIZED & SPACED ... MANUFACTURERS RECOMMENDATIONS.



SUGGESTED CONCRETE SUPPORT BLOCK



TYPICAL CONSTRUCTION JOINT

STEEL SCHEDULE

MARK	LOCATION	SIZE	INSIDE	LENGTH	TYPE	A	B	C	TOTAL
1	RISER	16	5	13-6	1				169
2		2	5	12-6	1				25
3		27	5	7-0	1				189
4		22	6	4-7	2	1-8	-11		103.5
5		8	6	13-1	2	3-6	9-7		104.5
6		6	6	11-2	2	1-0	9-7		67.
8		16	6	9-9	2	3-6	6-3		196.
9		44	5	9-5	2	3-6	6-1		414.
10		12	6	10-3	1				108.
11		12	6	9-3	1				111.
12		82	5	10-0	1				820.
13		12	6	4-6	1				54.
14		22	5	4-6	1				99.
15		48	6	8-0	1				384.
16		3	6	5-9	1				17.
17		9	6	4-0	1				36.
18		38	5	8-3	1				313.
19		22	5	11-9	1				258.
20		12	6	6-3	2	6-3	2-0		75.
21		24	6	12-0	1				288.
22		48	6	3-6	1				168.
23		6	6	3-0	1				18
24		8	6	5-3	1				42
C1	COLLARS (9)	60	6	1-9	1				105.
C2		40	6	9-3	1				370.
C3		30	6	13-6	1				405
C4		50	6	3-9	1				187
C5		20	6	6-0	1				120

20-HFP-1
FILE NUMBER

RECEIVED IN THE OFFICE OF THE WATER & POWER RESOURCES BOARD ... DEPARTMENT OF FORESTS & WATERS ON THE ... DAY OF ... A.D. 19..

Title

Pile Clerk

RECD. ... FOR ...
SEE REPORT NO. ...

Div. Dsgns.

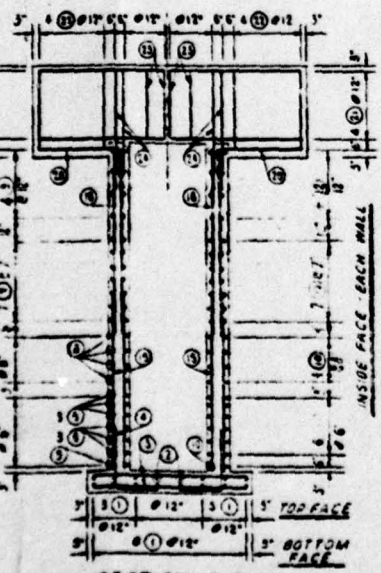
BAR TYPES

STEEL (THIS SHEET ONLY)

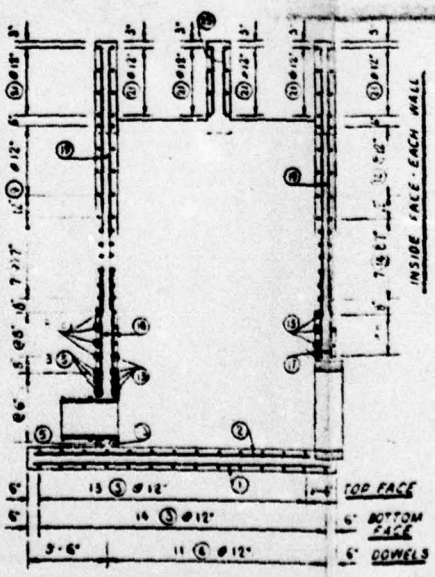
NO. 6 BARS 1778 LIN. FT. 1187 LBS.
NO. 5 BARS 1708 LIN. FT. 1792 LBS.
NO. 6 BARS 181 LIN. FT. 1218 LBS.
3007 LBS.

CONCRETE (THIS SHEET ONLY)

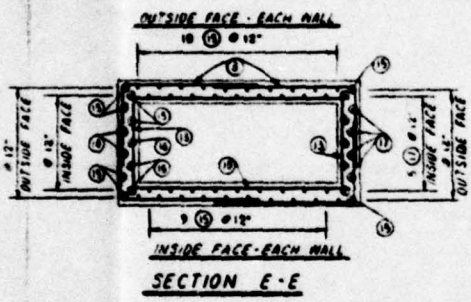
CLASS "B" 260 CU YDS (RISER)
CLASS "D" 14.3 CU YDS (ANTI-SEEP CLR & CRADLE)



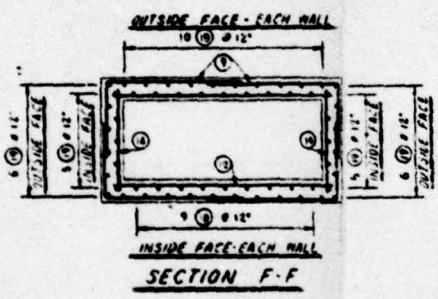
SECTION A-A



SECTION B-B



SECTION E-E



SECTION F-F

GENERAL NOTES:

1. ALL CONCRETE SHALL BE OF THE CLASS INDICATED ON THE DRAWINGS.
2. PORTLAND CEMENT TYPE I WITH AN AIR-ENTRAINING ADMIXTURE OR TYPE IA SHALL BE USED.
3. ALL REINFORCING STEEL TO BE LAPPED A MIN OF 30 BAR DIAMETERS.
4. ALL REINFORCING STEEL PLACED IN CONCRETE POURED AGAINST THE GROUND SHALL HAVE A MINIMUM OF 3" CLEAR COVER. WHERE FORMS ARE USED STEEL SHALL HAVE A MINIMUM OF 2" CLEAR COVER.
5. ALL EXPOSED EDGES OF CONCRETE TO HAVE 3/4" CHAMFER UNLESS OTHERWISE NOTED.
6. ALL METAL NOT GALVANIZED TO BE PAINTED SPEC. 14-58

PLATE 7

2

Note: Approx. Half Scale

SCALE ...

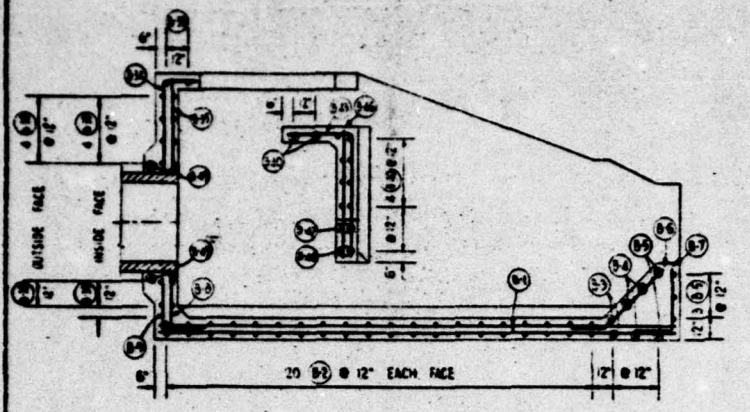
MILL RUN WATERSHED PROJECT
CRAWFORD COUNTY, PENNSYLVANIA
FLOODWATER RETARDING DAM PA-460

RISER DETAILS

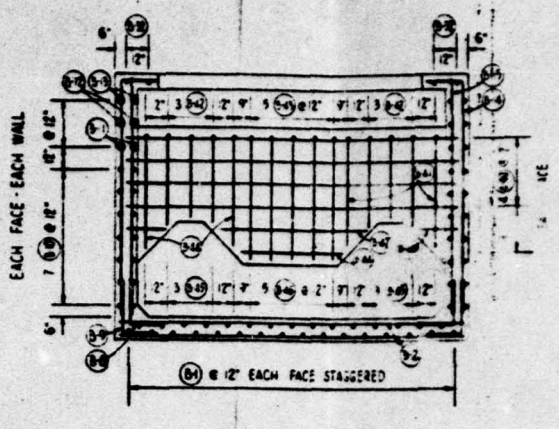
U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

	Date	Approved by
Designed S. WEAVER	May '62	Title
Drawn C. B. FORD	June '62	Title
Traced		Title
Checked S. C. CLAS	JL / 62	Sheet No. 11 of 25 Drawing No. PA-460-P

Form SCS-313 (November 1...

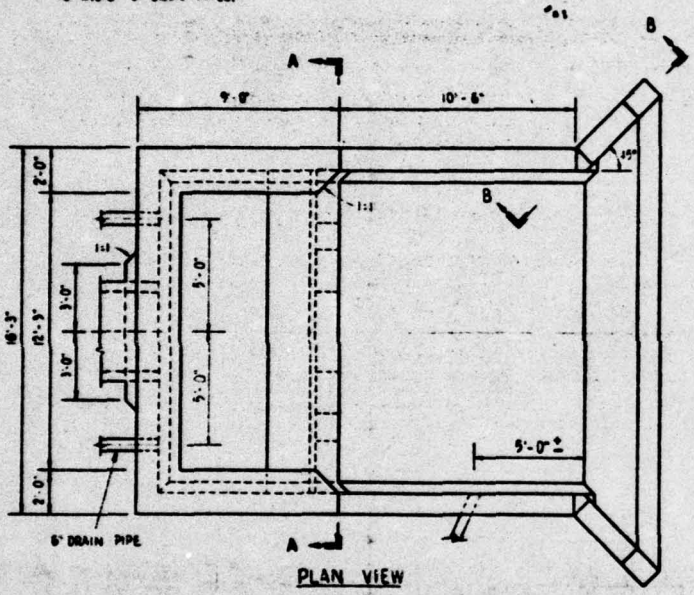


SECTION ON CENTERLINE

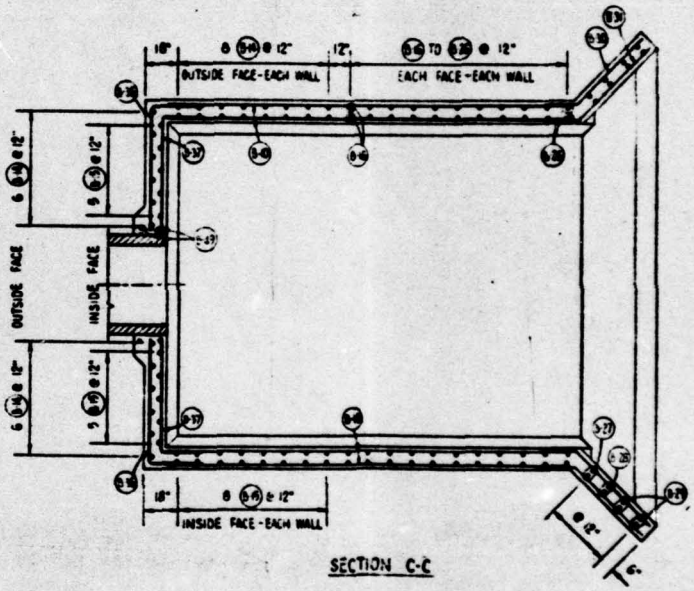


SECTION A-A

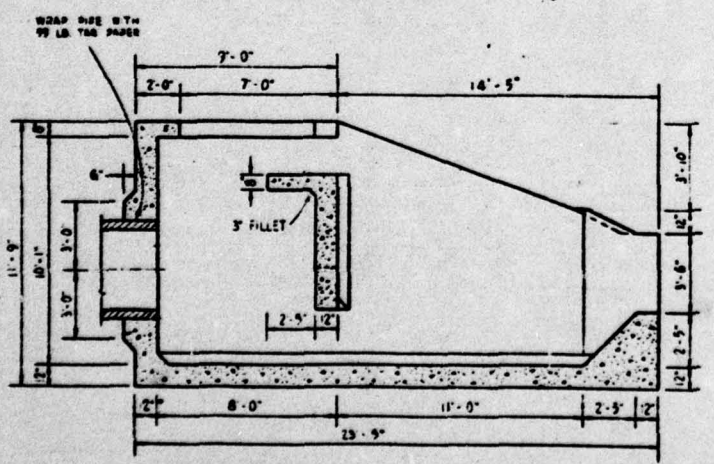
NOTE FIELD BEND REINFORCING BARS TO AVOID 6" DRAIN PIPES.



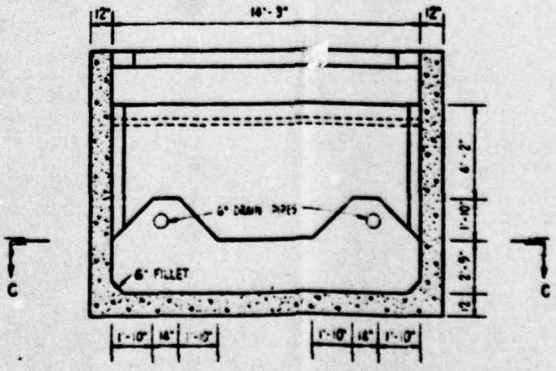
PLAN VIEW



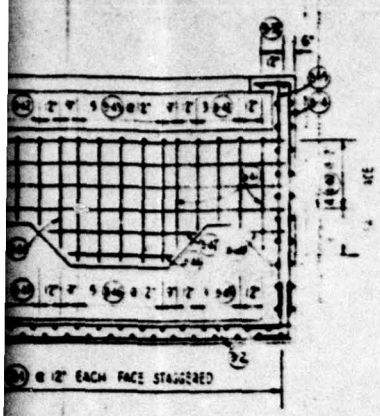
SECTION C-C



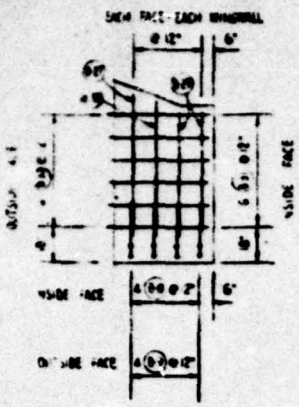
SECTION ON CENTERLINE



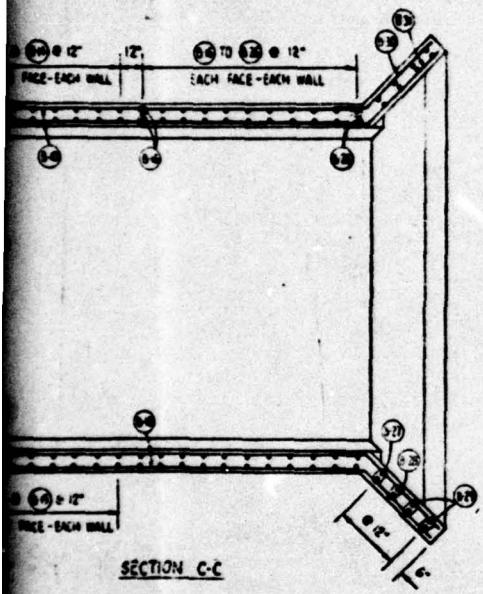
SECTION A-A



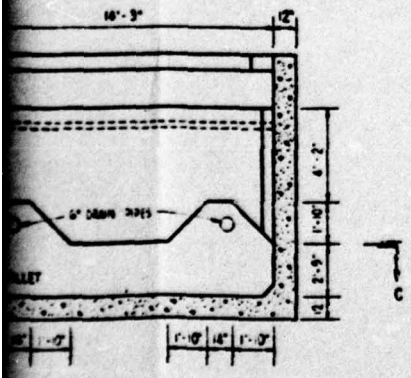
SECTION A-A



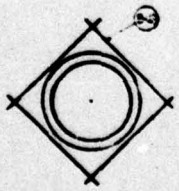
SECTION B-B



SECTION C-C



SECTION A-A



STEEL PLACEMENT AROUND 42" PIPE

STEEL SCHEDULE

MARK	DESCRIPTION	SIZE	SHAPE	LENGTH	TYPE	A	B	C	TOTAL FT
B-1		5	31	23-0	1				713
B-2			42	5-3	1				630
B-3			2	16-9	1				33.5
B-4			5	8-9	1				56.2
B-5			5	20-9	1				104
B-6			2	5-1	3	2-6	-7		7.6
B-7			6	4-7	2	3-0	-7		72
B-8			61	3-5	2	1-10	-7		209.4
B-9			60	4-0	2	2-6	-7		244
B-10			28	17-0	1				952
B-11			4	16-0	1				64
B-12			4	13-9	1				55
B-13			4	11-0	1				44
B-14			33	10-0	2	2-6	-6		330
B-15			26	10-6	1				273
B-16			4	10-3	1				41
B-17			4	10-7	1				4
B-18			4	9-6	1				38
B-19			41	9-5	1				37
B-20			4	8-9	1				35
B-21			4	8-6	1				34
B-22			4	8-0	1				32
B-23			4	7-9	1				31
B-24			4	7-8	1				31
B-25			4	7-0	1				28
B-26			4	6-9	1				27
B-27			4	6-3	1				25
B-28			4	6-0	1				24
B-29			9	5-9	1				46
B-30			12	5-7	3	4-0	-7		67
B-31			12	5-11	3	4-4	1-7		71
B-32	T2P SLAB		4	8-0	1				32
B-33			2	15-9	1				31
B-34			4	5-3	2	3-9	-6		21
B-35			5	4-0	1				20
B-36			8	7-11	2	5-6	2-5		63
B-37			8	6-9	4	4-0	-0		55.4
B-38			12	11-2	2	8-9	2-5		134
B-39			12	9-11	2	8-1	-10		119
B-40	BAFFLE	—	10	15-3	1				152.5
B-41	(DOWNSTREAM)		4	8-0	2	5-0	3-0		32
B-42			6	6-9	2	3-9	3-0		40
B-43			5	8-7	2	5-7	3-0		42.9
B-44	(UPSTREAM)		6	5-0	1				30
B-45			3	7-7	1				22.5
B-46			5	5-5	1				27.5
B-47	—		2	7-0	1				14.0
B-48	—		4	2-0	1				8.0
B-49	ANCHOR PIN		6	8-3					

BAR TYPES

STEEL (THIS SHEET ONLY)

NO. 5 BARS 4910.58 LIN. FT. 5153.0 LBS.

CLASS "B" CONCRETE (THIS SHEET ONLY) 44.9 CU YDS.

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Note: Approx Half Scale **PLATE 8**

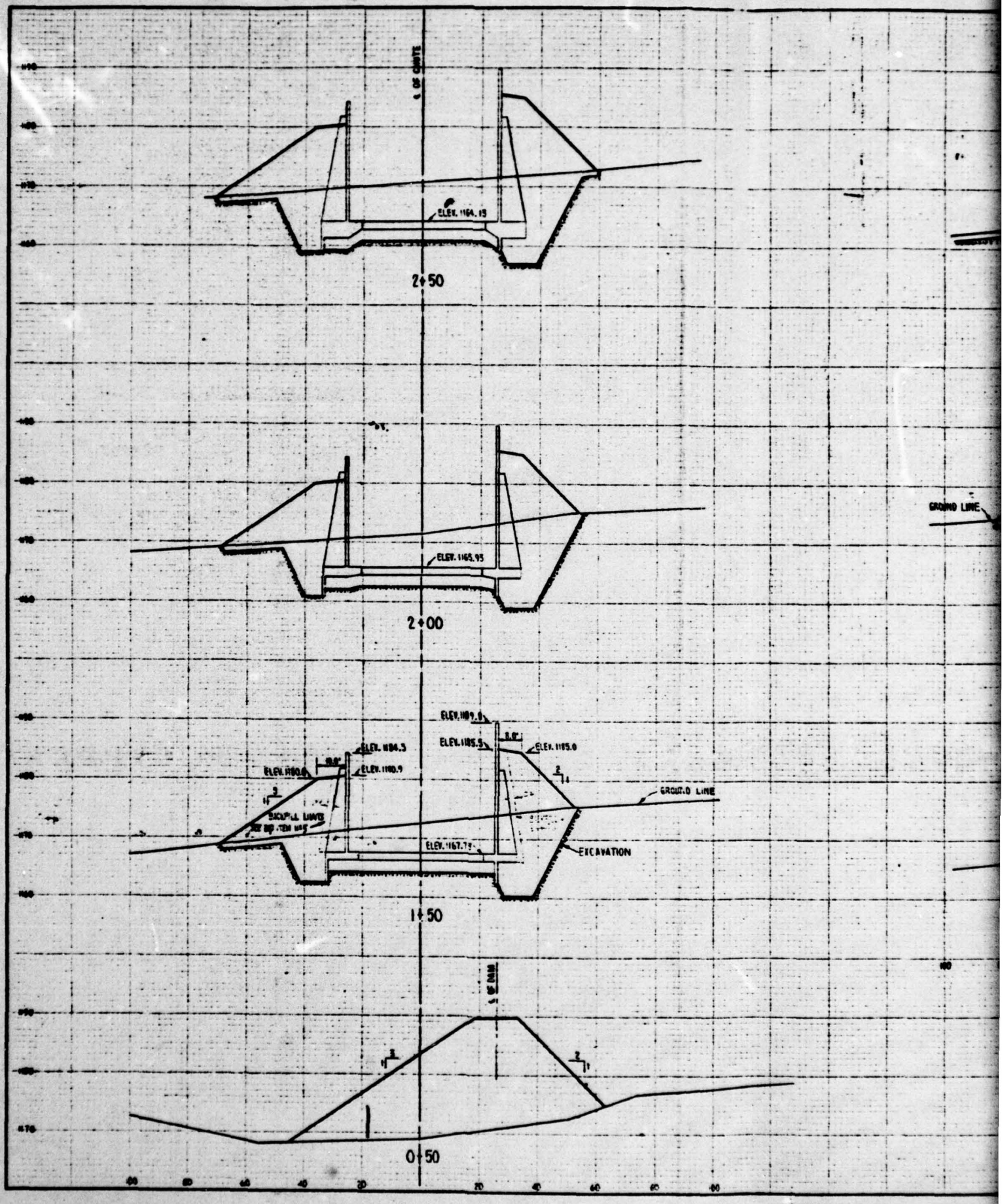
MILL RUN WATERSHED PROJECT
CRAWFORD COUNTY, PENNSYLVANIA
FLOODWATER RETARDING DAM PA-460

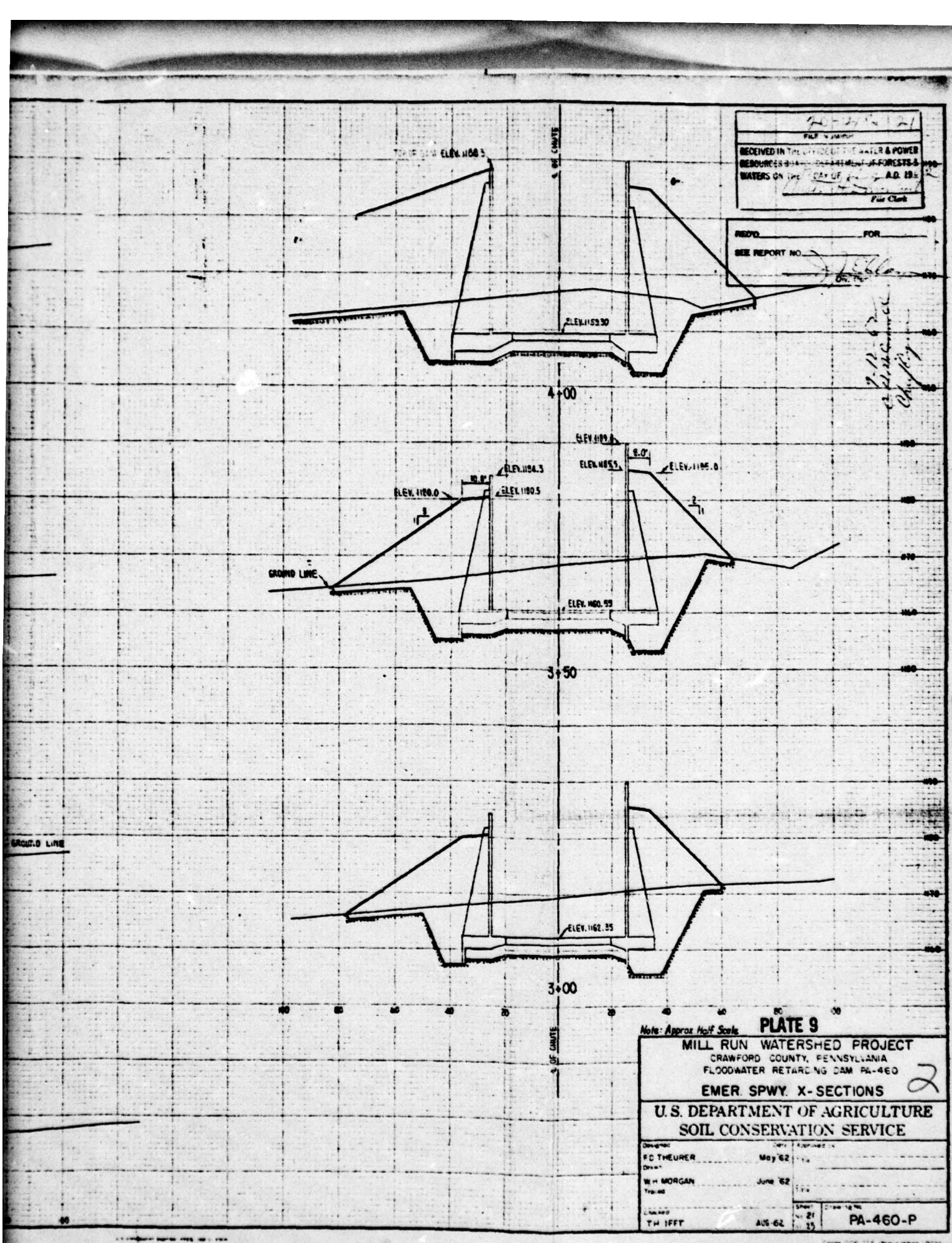
REINF. CONC. STILLING BASIN DETAILS

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Designed	Date	Approved by	
F.D. THEURER	May '62	Title	
Drawn			
E. SILVERMAN	JUNE 62	Title	
Traced			
Checked		Sheet No. 12 of 25 sheets	Drawing No. PA-460-P
H. L. ABEL	JULY 62		

2


℄ OF CHUTE
ELEV. 1164.15
2+50
ELEV. 1165.95
2+00
GROUND LINE
ELEV. 1189.0
ELEV. 1185.5
ELEV. 1185.0
ELEV. 1184.3
ELEV. 1180.9
ELEV. 1180.0
GROUND LINE
EXCAVATION
ELEV. 1167.7
1+50
℄ OF DAM
0+50



RECEIVED IN THE OFFICE OF THE WATER & POWER RESOURCES BOARD DEPARTMENT OF FORESTS & WATERS ON THE DAY OF A.D. 19
File Clerk

RECD. FOR
SEE REPORT NO.

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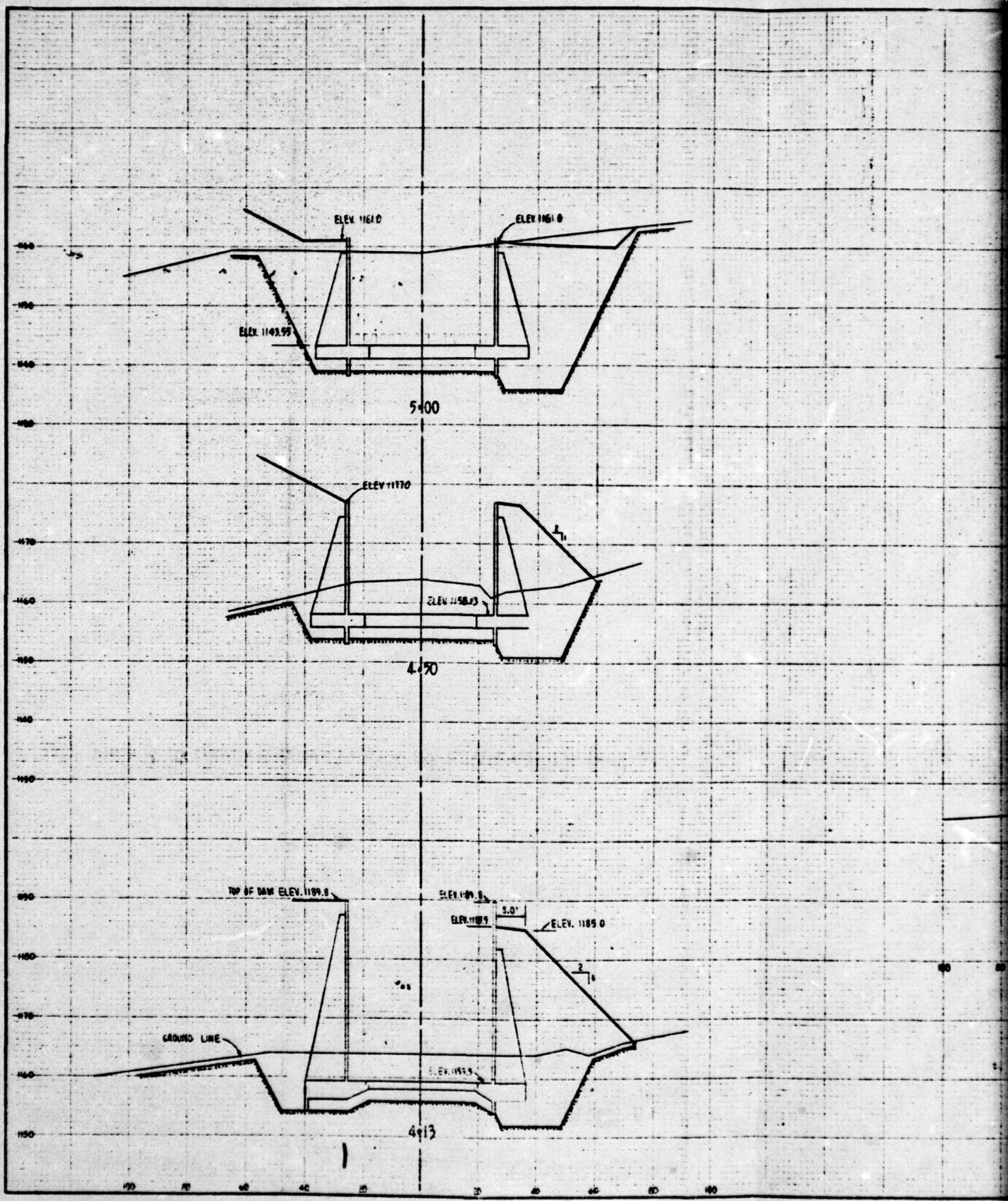
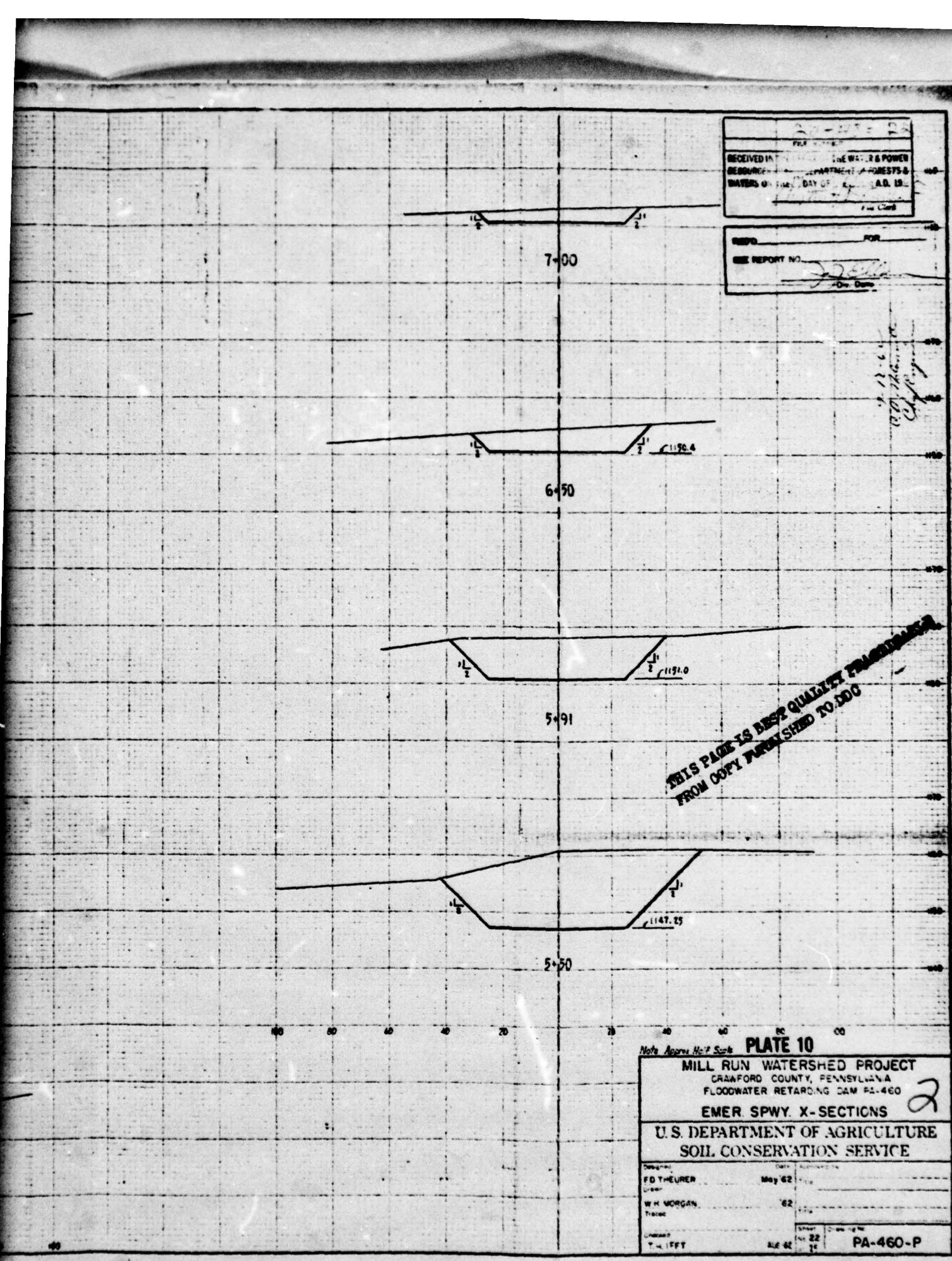
Form SCS-215 (November 1958)


ELEV. 1161.0
ELEV. 1161.0
ELEV. 1143.99
5+00
ELEV. 1170
ELEV. 1158.03
4+50
TOP OF DAM ELEV. 1189.8
ELEV. 1189.8
3.0'
ELEV. 1185.0
GROUND LINE
4+13



Note Approx Half Scale

PLATE 10

MILL RUN WATERSHED PROJECT
CRAWFORD COUNTY, PENNSYLVANIA
FLOODWATER RETARDING DAM PA-460

EMER. SPWY. X-SECTIONS

2

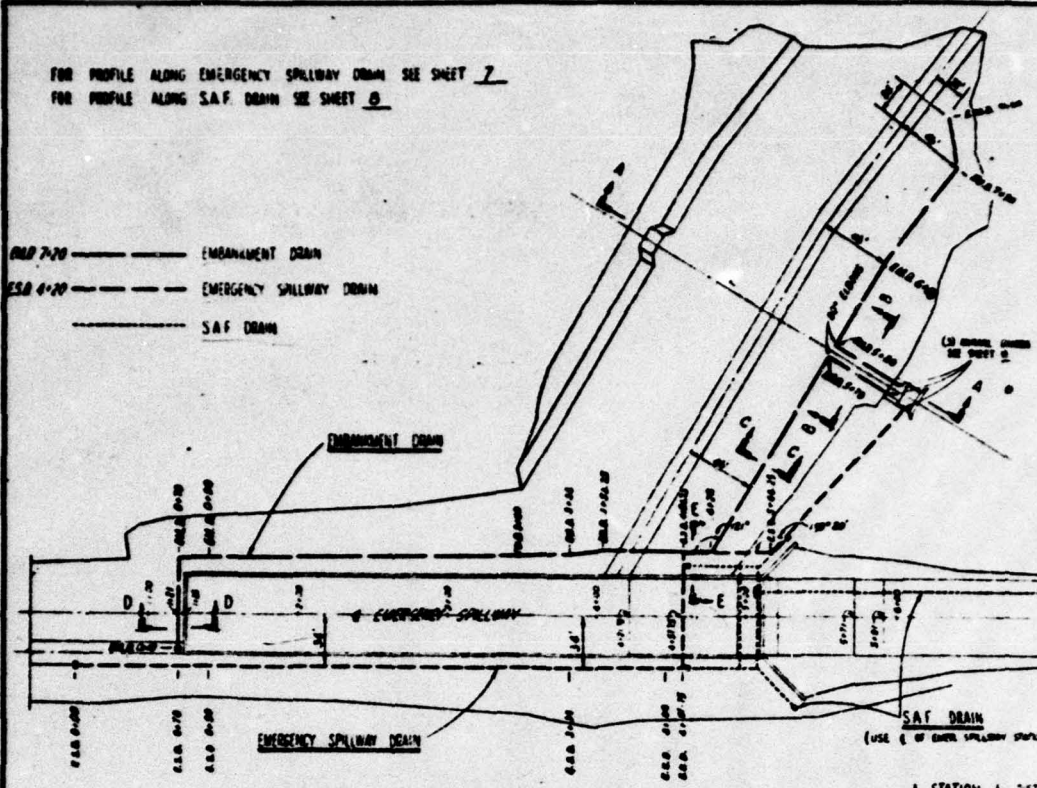
U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Designed FD THEURER	Date May '62	Approved	Title
Drawn W.H. MORGAN	'62		Title
Checked T.H. IFFT	ALE 62	Sheet No. 22	Drawing No. PA-460-P

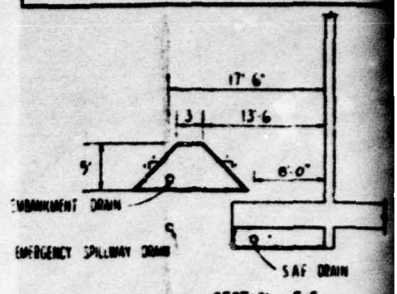
FOR PROFILE ALONG EMERGENCY SPILLWAY DRAIN SEE SHEET 7
FOR PROFILE ALONG S.A.F. DRAIN SEE SHEET 8

EMBANKMENT DRAIN 6" DIA. — B C
670 FT PERFORATED
40 FT NON-PERFORATED

EMD 7+20 —— —— EMBANKMENT DRAIN
ESD 4+20 —— — — EMERGENCY SPILLWAY DRAIN
—— SAF DRAIN



PLAN VIEW SCALE 1" = 60'

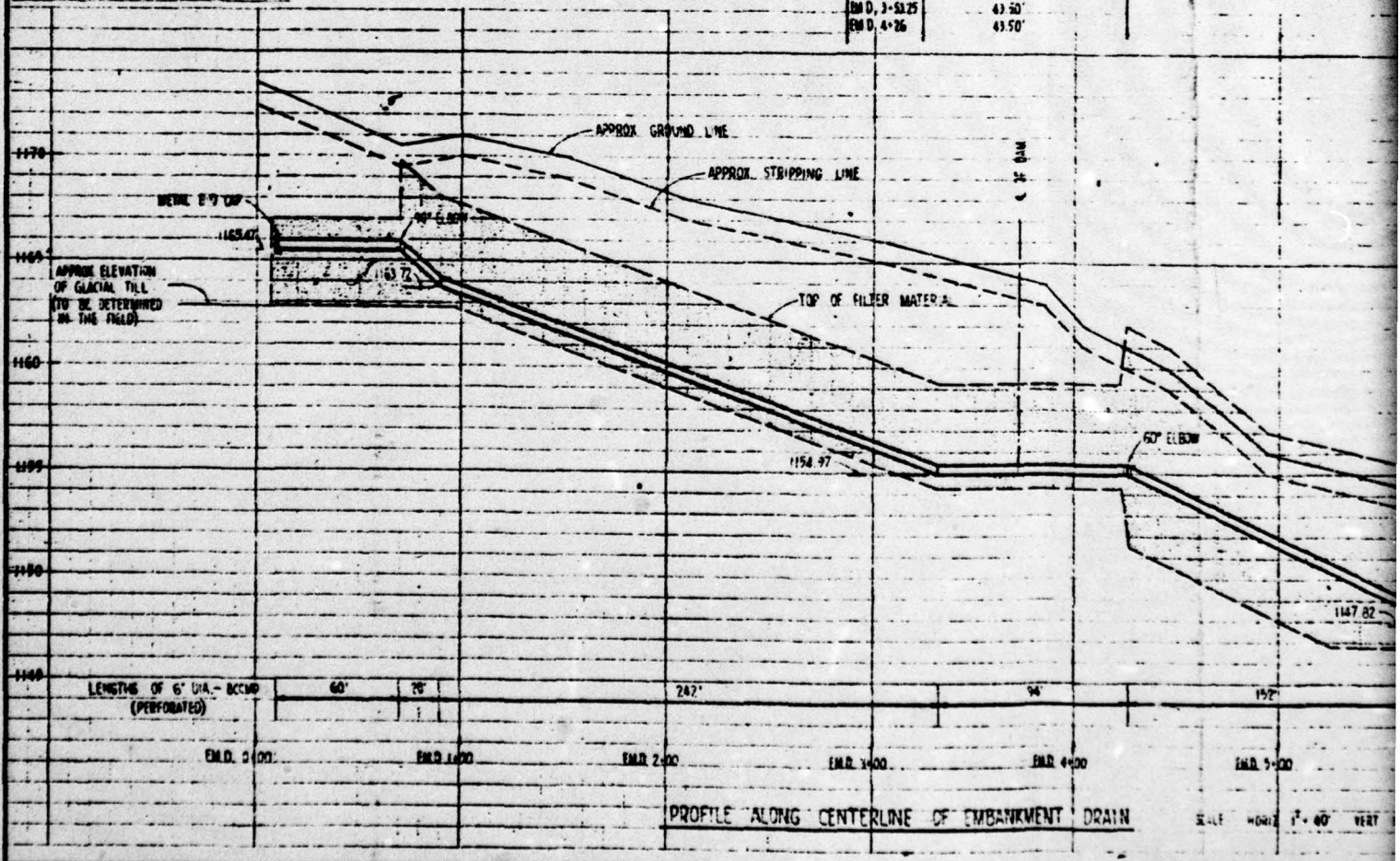


SECTION E-E SCALE

INVERT OF 6" DIA OUTLET PIPES ARE AT THE SAME ELEV AS THE PRINCIPAL SPILLWAY

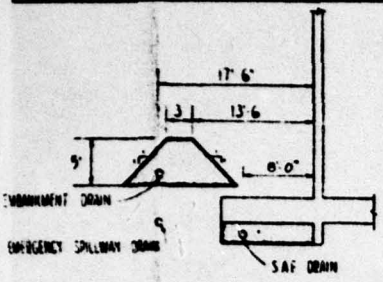
STATION	DISTANCE TO ℄ OF EM SPILLWAY
EMD 0+70	36 67'
EMD 0+92	36 67'
EMD 3+10	40.00
EMD 3+34	41.00'
EMD, 3+51.25	43 50'
EMD 4+26	43.50'

SAB 0+00 = 0+91 ON ℄ OF CHUTE
EMB 0+00 = 0+70 ON EMER SPILLWAY DRAIN

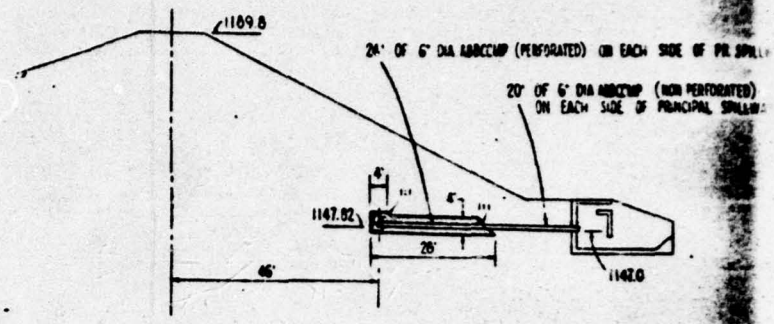


PROFILE ALONG CENTERLINE OF EMBANKMENT DRAIN SCALE HORIZ 1" = 60' VERT

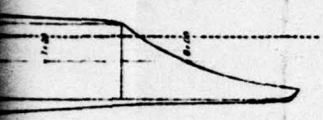
EMBANKMENT DRAIN 6" DIA. — BCCMP
678 FT PERFORATED
40 FT NON-PERFORATED

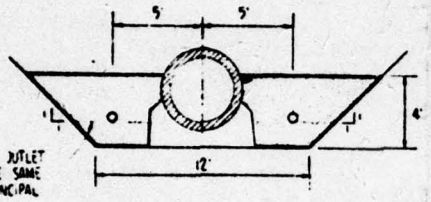


SECTION E-E SCALE 1" = 10'

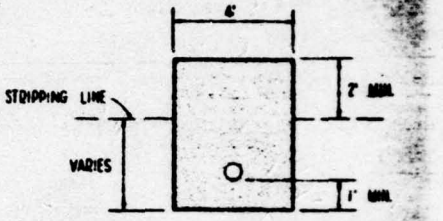


SECTION A-A SCALE 1" = 20'





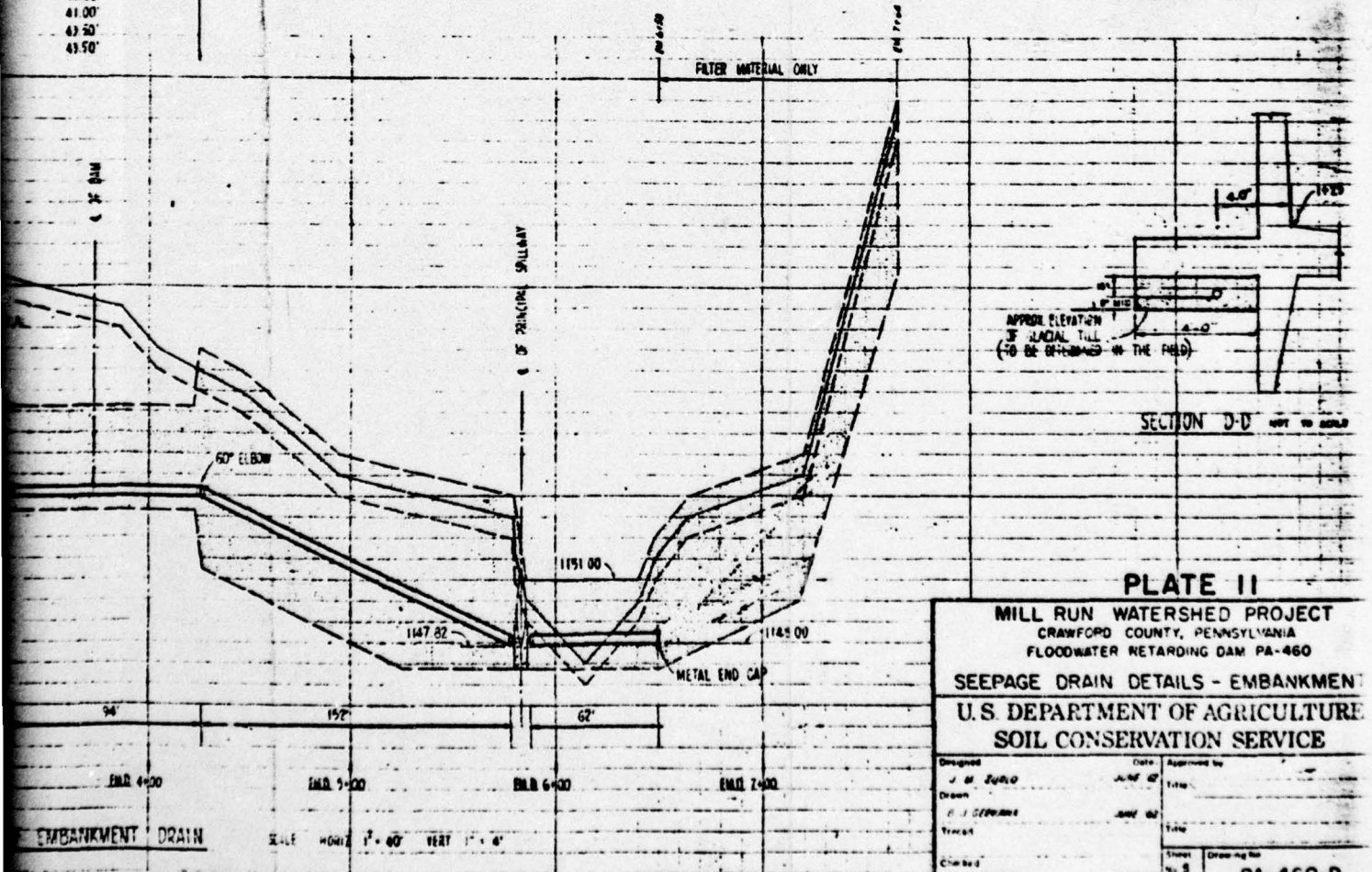
SECTION B-B SCALE 1" = 5'



SECTION C-C SCALE 1" = 3'

BETWEEN STA. ENLD 4+26 AND ENLD 5+50 AND STA. ENLD 6+50 TO ENLD 7+04 IS THE SAME EXCEPT PIPE IS OMITTED.

DISTANCE TO ℄ OF EM SPILLWAY
36 67'
36 67'
40.00'
41.00'
43.50'
43.50'



NOTE: Approx. Half Scale

SECTION D-D NOT TO SCALE

PLATE II

MILL RUN WATERSHED PROJECT
CRAWFORD COUNTY, PENNSYLVANIA
FLOODWATER RETARDING DAM PA-460

SEEPAGE DRAIN DETAILS - EMBANKMENT

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Designed	Date	Approved by
J. M. ZUPKO	JUNE 62	Title
Drawn		
R. J. STEPHENS	JUNE 62	Title
Traced		
Checked		Sheet No. 9 of 25
T. D. THOMPSON	JUNE 62	Drawing No. PA-460-P

2

APPENDIX A

CHECK LIST - VISUAL INSPECTION AND FIELD SKETCHES

Check List
Visual Inspection
Phase 1

Name of Dam Meadville Dam (PA 460) County Crawford State PA Coordinates Lat. N 41° 38.3'
Long. W 80° 8.2'

NDI # PA 00177
PennDER # 20-48

Date of Inspection 1 Dec. 1978 Weather Cloudy Temperature 55°F.

Pool Elevation at Time of Inspection 1163.7 ft. M.S.L. Tailwater at Time of Inspection 1148.6 ft. M.S.L.

Inspection Personnel:

Michael Baker, Jr., Inc.:

James G. Ulinski
Rodney E. Holderbaum
David F. Johns

Owner's Representative
City of Meadville:

Kenneth A. Beers, Jr., Public Works
John Coulter
Joe Damico

David F. Johns Recorder

CONCRETE/MASONRY DAMS - Not Applicable

Name of Dam: MEADVILLE DAM
NDI # PA 00177

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
LEAKAGE		
STRUCTURE TO ABUTMENT/EMBANKMENT JUNCTIONS		
DRAINS		
WATER PASSAGES		
FOUNDATION		

Name of Dam: MEADVILLE DAM
NDI # PA 00177

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS CONCRETE SURFACES		
STRUCTURAL CRACKING		
VERTICAL AND HORIZONTAL ALIGNMENT		
MONOLITH JOINTS		
CONSTRUCTION JOINTS		

Name of Dam: MEADVILLE DAM
NDI # PA 00177

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS	No surface cracks were observed.	
UNUSUAL MOVEMENT OR CRACKING AT OR BEYOND THE TOE	No bulges, cracks, or apparent earth movements were observed at or beyond the embankment toe.	
SLOUGHING OR EROSION OF EMBANKMENT AND ABUTMENT SLOPES (cont. on p. A-5)	1. On the east slope of the dike, south of the auxiliary spillway, vehicular traffic has caused rutting of the slope. Rutting has also occurred along the crest south of the auxiliary spillway.	1. The rutted areas should be regraded, treated, and seeded.
	2. Pedestrian traffic has caused a large pathway to be worn through the grass cover from Meadville High School east of the dike, over the dike, up the south slope of the dam, and along the crest of the dam.	2. These areas should be regraded, treated, and seeded with an appropriate mixture to prevent erosion.
	3. A rut was observed along the outside of the chain-link fence around the auxiliary spillway.	3. The area should be regraded, treated, and seeded as necessary.
	4. A ditch, 0.5 ft. wide by 0.4 ft. deep and approximately 10 ft. long, has eroded down to the slope behind the wing wall on the right side of the auxiliary spillway. The left side also has an erosion ditch of equal proportion.	4. The ditch should be regraded, treated, and seeded. If the problem is recurring, a paved drainage ditch should be provided.

Name of Dam: MEADVILLE DAM
NDI # PA 00177

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SLOUGHING OR EROSION OF EMBANKMENT AND ABUTMENT SLOPES (Continued)	5. On the downstream face of the embankment 100 ft. from the left abutment, a major erosion channel approximately 2 ft. wide and 1 ft. deep has developed. Smaller channels have eroded at 50 ft. and 150 ft. from the left abutment.	5. These areas should be regraded, treated, and seeded. Effort should be made to prohibit motorcycles from traversing the slopes.
VERTICAL AND HORIZONTAL ALIGNMENT OF THE CREST	1. Vertical Alignment--The surveyed crest shows a slight variation in elevation across the crest due to erosion caused by pedestrian and vehicular traffic. 2. Horizontal Alignment--No misalignment was observed.	1. The crest should be regraded, treated, and seeded.
RIPRAP FAILURES	No riprap was placed on the upstream slope. Very slight erosion of the 2H:1V slope was observed on the embankment.	The limited areas of slope erosion should be regraded and seeded. Minor erosion should be repaired promptly. If serious erosion occurs in the future, riprap protection may become necessary.
JUNCTION OF EMBANKMENT AND ABUTMENT, SPILLWAY AND DAM	No problems were noted.	

Name of Dam: MEADVILLE DAM
NDI # PA 00177

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
ANY NOTICEABLE SEEPAGE	None	
STAFF GAGE AND RECORDER	None	
DRAINS	1. The drain in the auxiliary spillway is covered with debris. 2. The embankment drains could not be assessed due to the amount of water flowing in the outlet basin.	1. The drain should be cleaned as part of a routine preventative maintenance schedule.

OUTLET WORKS

Name of Dam: MEADVILLE DAM
NDI # PA 00177

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CRACKING AND SPALLING OF CONCRETE SURFACES IN OUTLET CONDUIT	The wing walls and head walls are in good condition.	
INTAKE STRUCTURE	The concrete on the drop-inlet structure is in good condition.	
OUTLET STRUCTURE	No noticeable defects were observed except for the erosion between the head wall and chain-link fence.	Eroded areas should be treated and seeded with an appropriate mixture to prevent erosion.
OUTLET CHANNEL	A small area has eroded at the end of the left wing wall.	The area should be treated and seeded. If the problem recurs, riprap should be provided to prevent erosion.
EMERGENCY GATE	The sluice gate for operation of the 18-in. pond drain was not in proper working condition.	The gate should be repaired or replaced as necessary.

UNGATED SPILLWAY (Auxiliary Spillway) A-8

Name of Dam: MEADVILLE DAM
NDI # PA 00177

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONCRETE WEIR	None	
APPROACH CHANNEL	1. Some minor spalling was observed on the south wall of the channel.	1. The concrete should be repaired as necessary.
	2. Some cracks were observed on the vertical walls adjacent to the dam abutment.	2. The cracks should be repaired as necessary.
	3. Some movement of the walls along the channel was noted.	3. According to the local personnel, the SCS is making a study of this movement since it was noted in their 17 May 1968 annual inspection.
DISCHARGE CHANNEL	The downstream channel is an earth channel with grass lining and is in good condition.	
BRIDGE AND PIERS	None	

GATED SPILLWAY - Not Applicable

Name of Dam: MEADVILLE DAM
NDI # PA 00177

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONCRETE SILL		
APPROACH CHANNEL		
DISCHARGE CHANNEL		
BRIDGE AND PIERS		
GATES AND OPERATION EQUIPMENT		

INSTRUMENTATION - None

Name of Dam: MEADVILLE DAM
NDI # PA 00177

VISUAL EXAMINATION	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
MONUMENTATION/SURVEYS		
OBSERVATION WELLS		
WEIRS		
PIEZOMETERS		
OTHER		

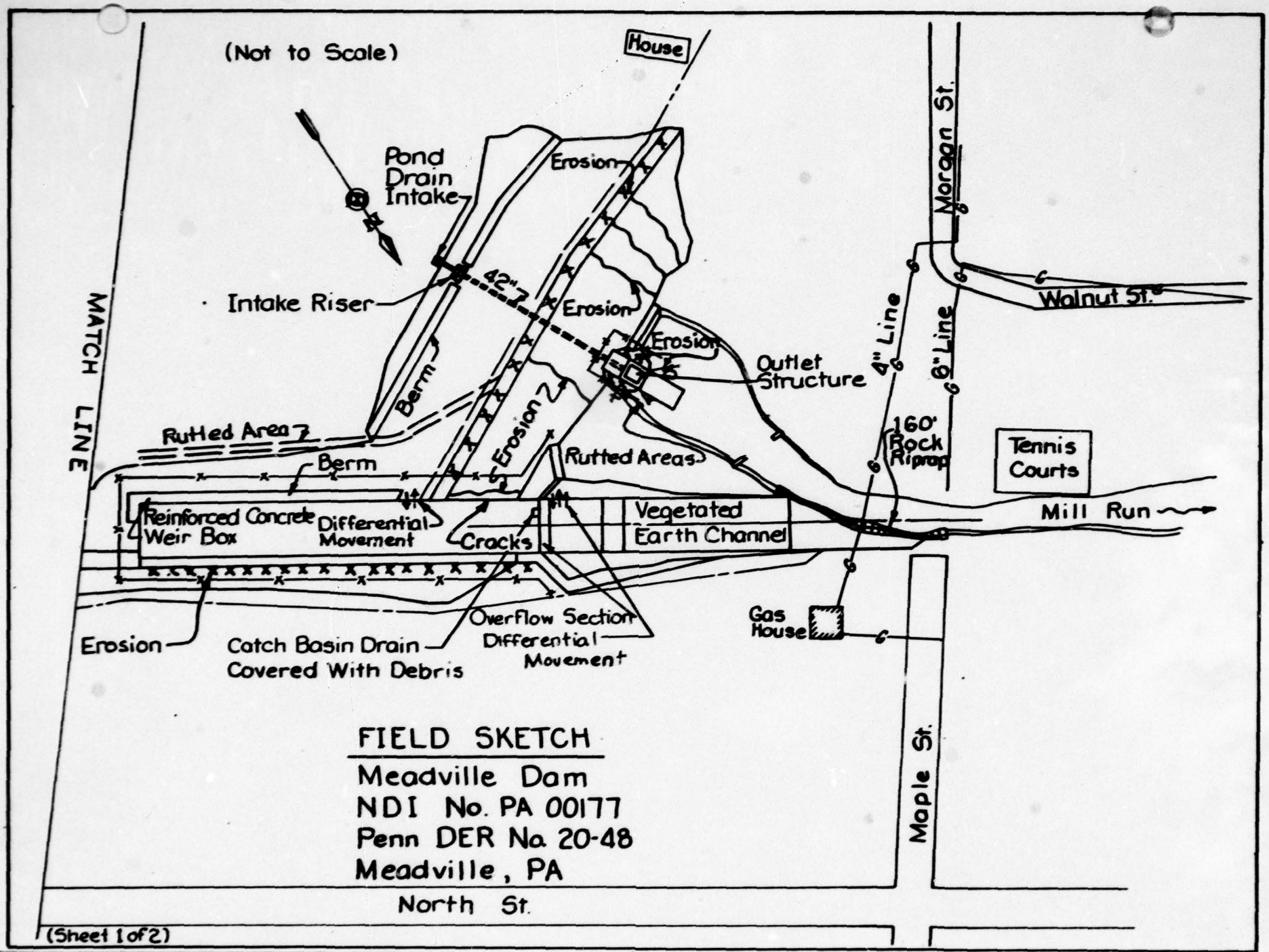
Name of Dam: MEADVILLE DAM
NDI # PA 00177

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SLOPES	The slopes are gentle to moderately steep with well established tree and grass cover.	
SEDIMENTATION	No sedimentation studies have been performed, but sedimentation of the reservoir is believed to be minimal.	

DOWNSTREAM CHANNEL

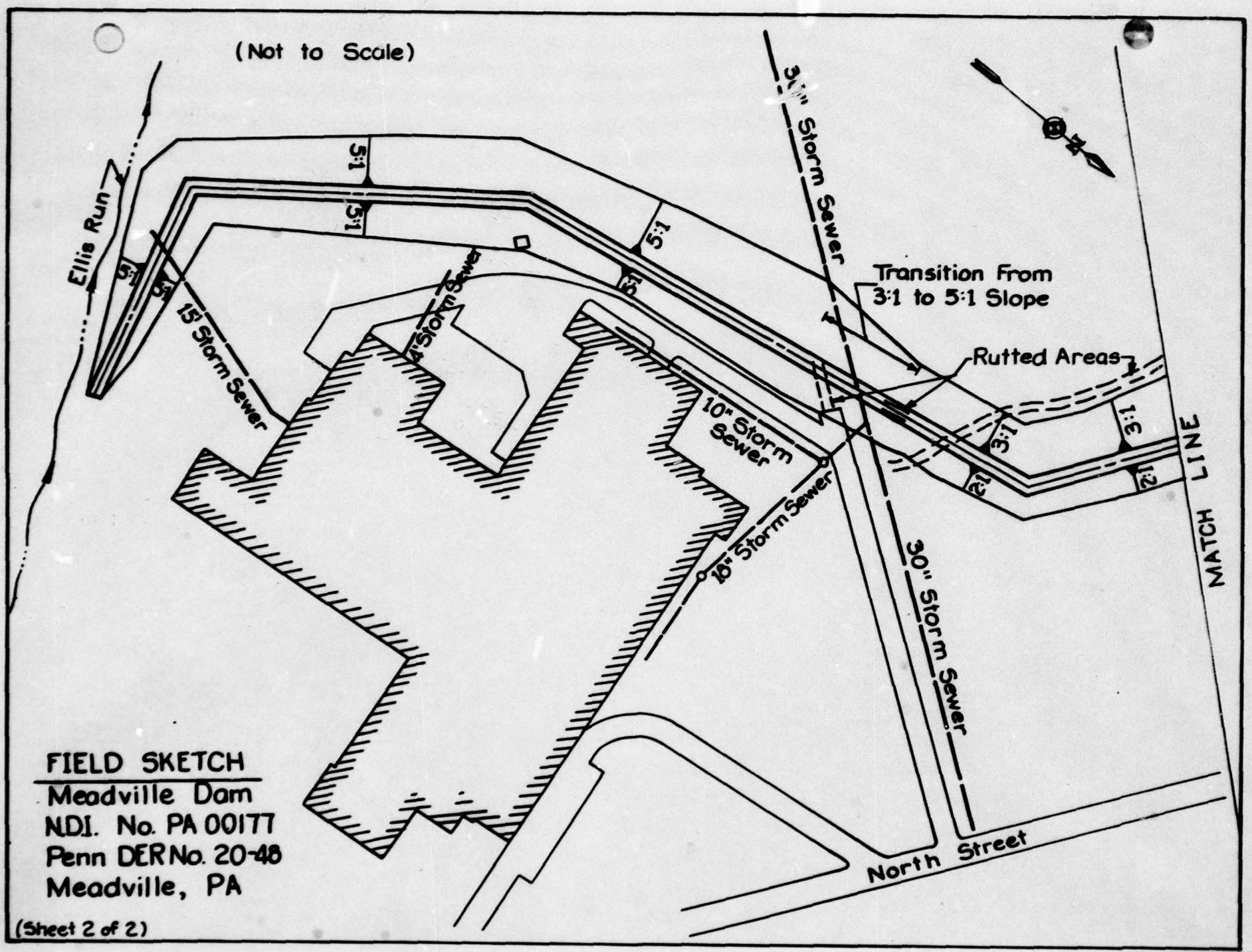
Name of Dam: MEADVILLE DAM
NDI # PA 001177

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONDITION (OBSTRUCTIONS, DEBRIS, ETC.)	The downstream area has no signs of previous erosion. The banks were covered with well established vegetation.	
SLOPES	The slopes are nearly flat to moderate with a good cover of grasses or stands of trees.	
APPROXIMATE NO. OF HOMES AND POPULATION	The city of Meadville has an estimated population of 16,500 persons (1970 census).	



FIELD SKETCH

Meadville Dam
NDI No. PA 00177
Penn DER No. 20-48
Meadville, PA


(Not to Scale)
Ellis Run
5:1
5:1
5:1
5:1
5:1
5:1
15" Storm Sewer
4" Storm Sewer
10" Storm Sewer
18" Storm Sewer
30" Storm Sewer
Transition From
3:1 to 5:1 Slope
Rutted Areas
3:1
3:1
3:1
3:1
MATCH LINE
North Street
FIELD SKETCH
Meadville Dam
N.D.I. No. PA 00177
Penn DER No. 20-48
Meadville, PA
(Sheet 2 of 2)

APPENDIX B

CHECK LIST - ENGINEERING DATA

CHECK LIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION

Name of Dam: MEADVILLE DAM
NDI # PA 00177

ITEM	REMARKS
PLAN OF DAM	See Plates 3, 4, and 5.
REGIONAL VICINITY MAP	See Plate 1, a USGS 7.5 minute quadrangle map showing dam location with state location inset.
CONSTRUCTION HISTORY	Information from the PennDER files indicate the dam was constructed in 1963 and 1964 by the Smith Construction Company, Ohio.
TYPICAL SECTIONS OF DAM	See Plates 6, 9, and 10.
HYDROLOGIC/HYDRAULIC DATA	Design conputations are included in the SCS "Design Report".
OUTLETS - PLAN	See Plate 4.
- DETAILS	See Plates 6 and 8.
- CONSTRAINTS	See Plate 7.
- DISCHARGE RATINGS	None available
RAINFALL/RESERVOIR RECORDS	None available

Name of Dam: MEADVILLE DAM
NDI # PA 00177

ITEM	REMARKS
DESIGN REPORTS	The SCS report, "Mill Run Watershed, Site PA 460, Vol. 2." was available through PennDER.
GEOLOGY REPORTS	See Appendix E.
DESIGN COMPUTATIONS HYDROLOGY & HYDRAULICS DAM STABILITY SEEPAGE STUDIES	Design computations were done by the SCS for hydrology and hydraulics. Seepage and stability studies were also done by the SCS.
MATERIALS INVESTIGATIONS BORING RECORDS LABORATORY FIELD	A foundation and borrow investigation was performed with test pits and test borings (see Plates 3 and 4); the computations are contained in the SCS "Design Report."
POST-CONSTRUCTION SURVEYS OF DAM	The dam is inspected yearly by the SCS and personnel from the city of Meadville, Department of Public Works.
BORROW SOURCES	Boring and Test Pit Logs. Reference Drawings - Plates 3 and 4.

Name of Dam: MEADVILLE DAM
NDI # PA 00177

ITEM	REMARKS
MONITORING SYSTEMS	No monitoring systems were designed into the dam.
MODIFICATIONS	None
HIGH POOL RECORDS	None available
POST-CONSTRUCTION ENGINEERING STUDIES AND REPORTS	During May 1964, the SCS investigated the structure by boring several holes in the embankment to obtain samples for shear tests, moisture density relationships, and other as determined necessary at the time of investigation. The results are contained in the PennDER files.
PRIOR ACCIDENTS OR FAILURE OF DAM DESCRIPTION REPORTS	None
MAINTENANCE OPERATION RECORDS	Yearly inspections are made by the SCS along with personnel from the city of Meadville, Department of Public Works. Maintenance performed has included erosion repair, liming, fertilizing, seeding, and mowing of the embankment and surrounding areas.

Name of Dam: MEADVILLE DAM
NDI # PA 00177

ITEM	REMARKS
SPILLWAY PLAN	See Plate 4.
SECTIONS	See Plates 9 and 10.
DETAILS	See Plate 8.
OPERATING EQUIPMENT PLANS & DETAILS	A water control gate is provided in the riser; however, at the time of inspection it was not operating correctly. Plans and details are shown on Plate 6. During periods of heavy rains the water level is monitored by city of Meadville, Department of Public Works personnel.

CHECK LIST
HYDROLOGIC AND HYDRAULIC DATA
ENGINEERING DATA

DRAINAGE AREA CHARACTERISTICS: 7.96 sq.mi. (primarily forested)

ELEVATION TOP NORMAL POOL (STORAGE CAPACITY): 1163.5 ft. (30 ac.-ft.)

ELEVATION TOP FLOOD CONTROL POOL (STORAGE CAPACITY): 1189.5 ft. (850 ac.-ft.)

ELEVATION MAXIMUM DESIGN POOL: 1189.8 ft.

ELEVATION TOP DAM: 1189.8 ft. (Design), 1189.5 ft. (Minimum)

CREST: Auxiliary (Emergency) Spillway

a. **Elevation** 1183.3 ft.
b. **Type** Reinforced concrete weir box and chute channel
c. **Width** 50 ft.
d. **Length** Approximately 316 ft.
e. **Location Spillover** Adjacent to right abutment
f. **Number and Type of Gates** None

OUTLET WORKS: Principal Spillway

a. **Type** Drop-inlet with 42-in. R.C.P.
b. **Location** Approximately 230 ft. from left abutment
c. **Entrance inverts** El. 1150.0 ft.
d. **Exit inverts** El. 1147.0 ft.
e. **Emergency draindown facilities** 18 in. B.C.C.M.P. pond drain

HYDROMETEOROLOGICAL GAGES: None

a. **Type**
b. **Location**
c. **Records**

MAXIMUM NON-DAMAGING DISCHARGE Unknown

APPENDIX C

PHOTOGRAPHS

DETAILED PHOTOGRAPH DESCRIPTIONS

Overall Views of Dam -

Top Photo - View of Downstream Embankment and Concrete Spillway (Note Erosion Channel on Embankment)

Bottom Photo - View of Upstream Face of Dam from Dike on East Abutment (Note Ruts and Erosion on Face of Dam)

Photo 1 - View from Top of Dam Looking East Toward Auxiliary Spillway and Dike

Photo 2 - View from Dike Looking West (Normal Pool of Reservoir Left-Center of Photo behind Baseball Backstop)

Photo 3 - View of Grass-Lined Auxiliary Spillway Channel from Crest of Ogee Spillway (Note Energy Dissipaters at Bottom of Ogee Spillway)

Photo 4 - View Looking Downstream from Outlet Pipe

Photo 5 - View of Riser Located at Toe of Upstream Embankment

Photo 6 - View of Head Wall and Outlet Structure at Toe of Downstream Embankment (Note Erosion between Structure and Fence)

Photo 7 - View from South End of Auxiliary Spillway

Photo 8 - Close-up View of South End of Auxiliary Spillway

Note: Photographs were taken on 1 December 1978.

MEADVILLE DAM

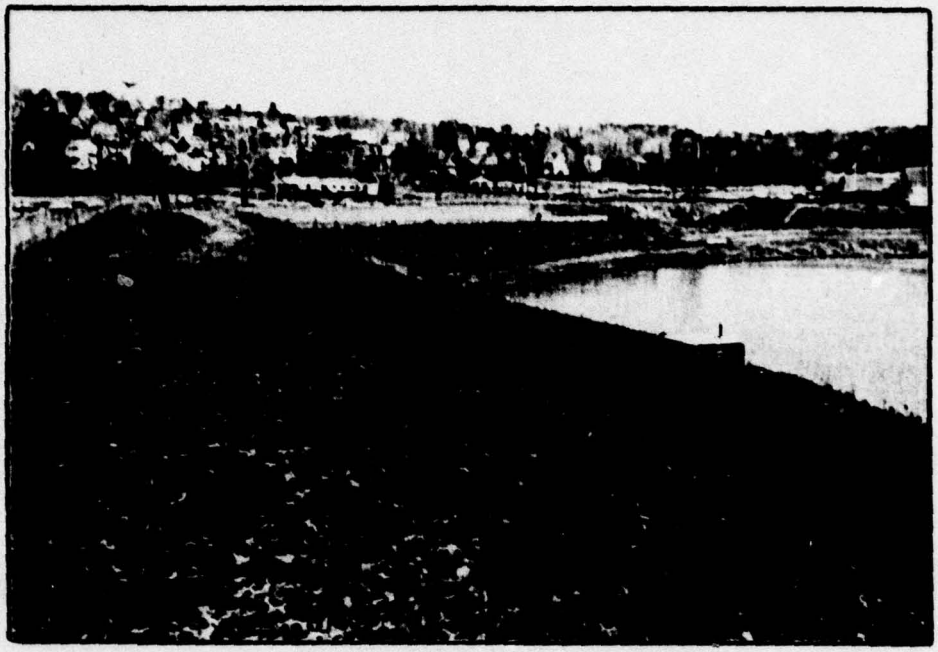


PHOTO 1. View from Top of Dam Looking East Toward Auxiliary Spillway and Dike

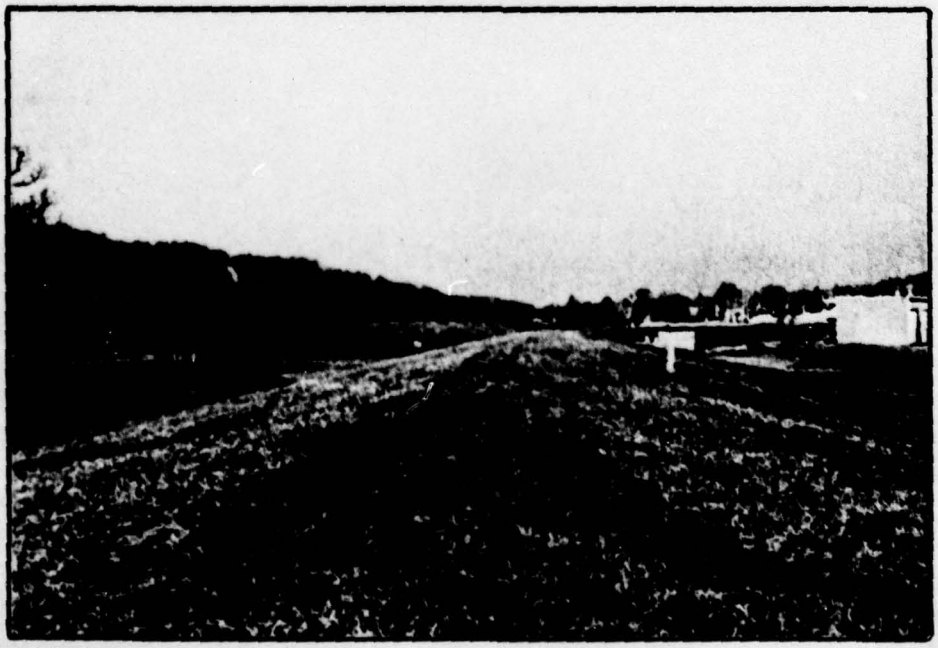


PHOTO 2. View from Dike Looking West (Normal Pool of Reservoir Left-Center of Photo behind Baseball Backstop)

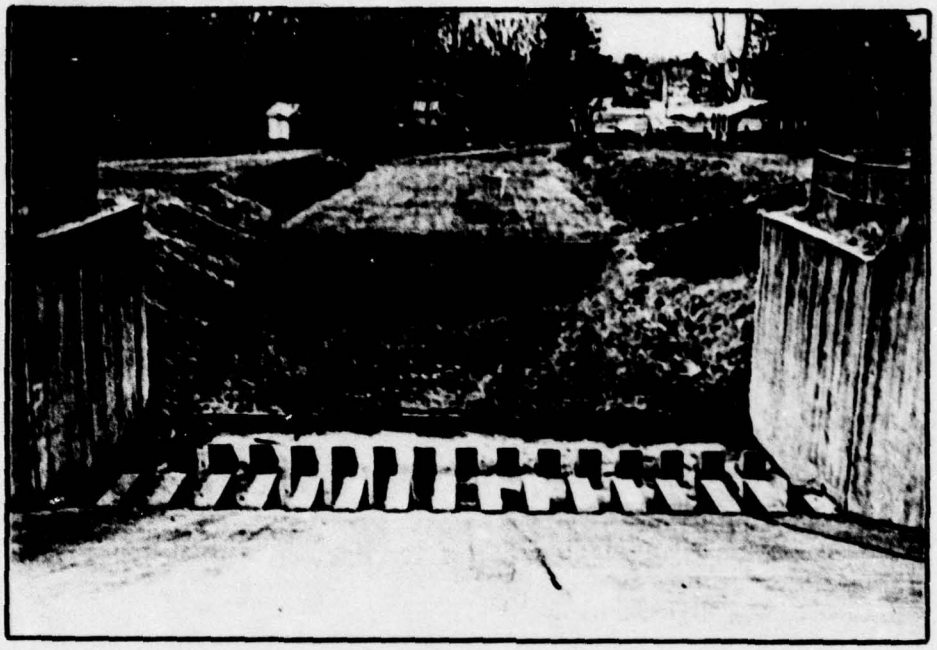


PHOTO 3. View of Grass-Lined Auxiliary Spillway Channel from Crest of Ogee Spillway (Note Energy Dissipaters at Bottom of Ogee Spillway)

PHOTO 4. View Looking Downstream from Outlet Pipe

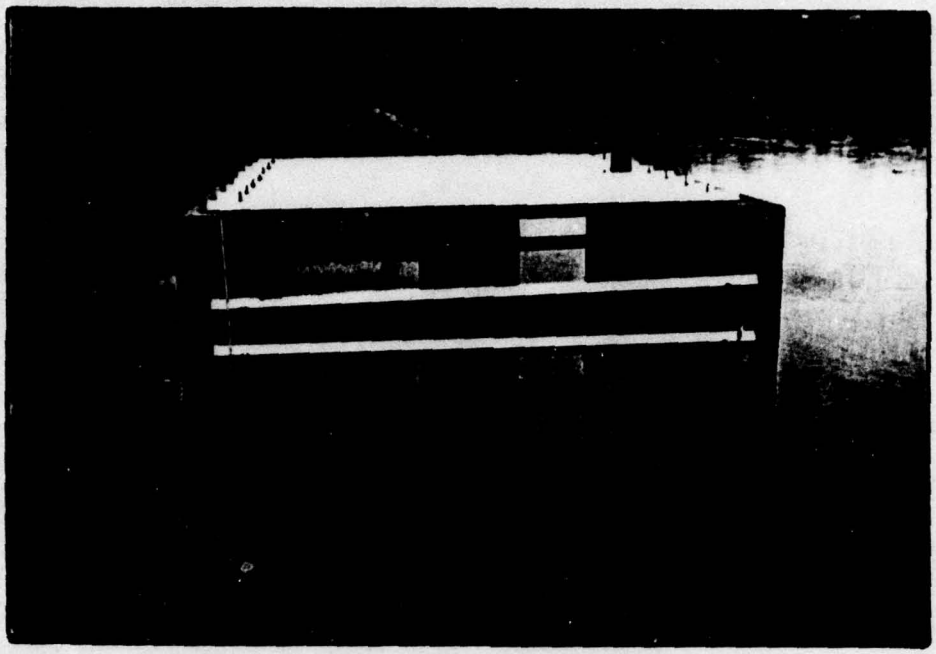


PHOTO 5. View of Riser Located at Toe of Upstream Embankment

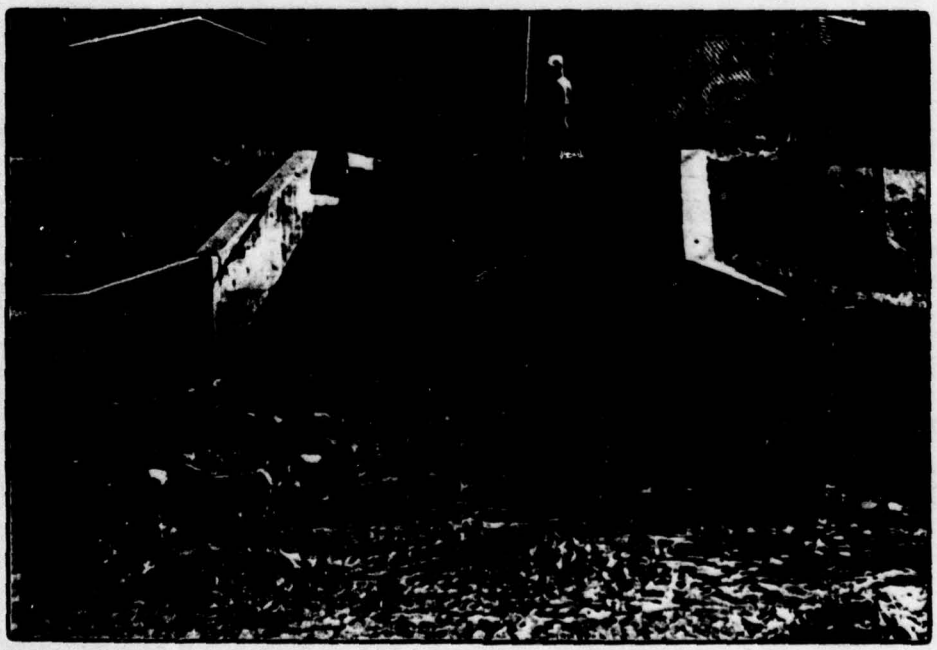


PHOTO 6. View of Head Wall and Outlet Structure at Toe of Downstream Embankment (Note Erosion between Structure and Fence)

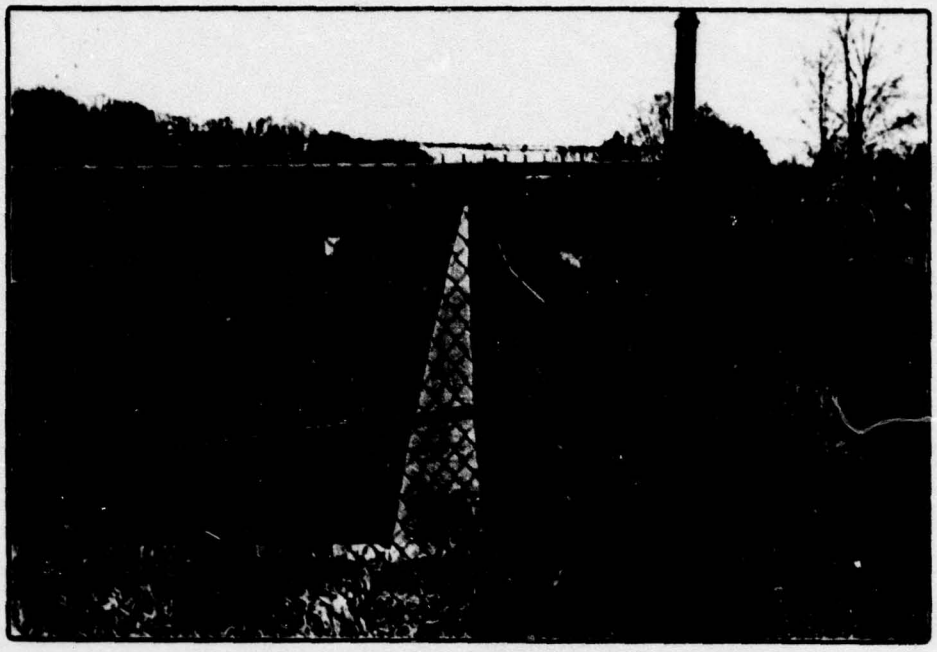


PHOTO 7. View from South End of Auxiliary Spillway

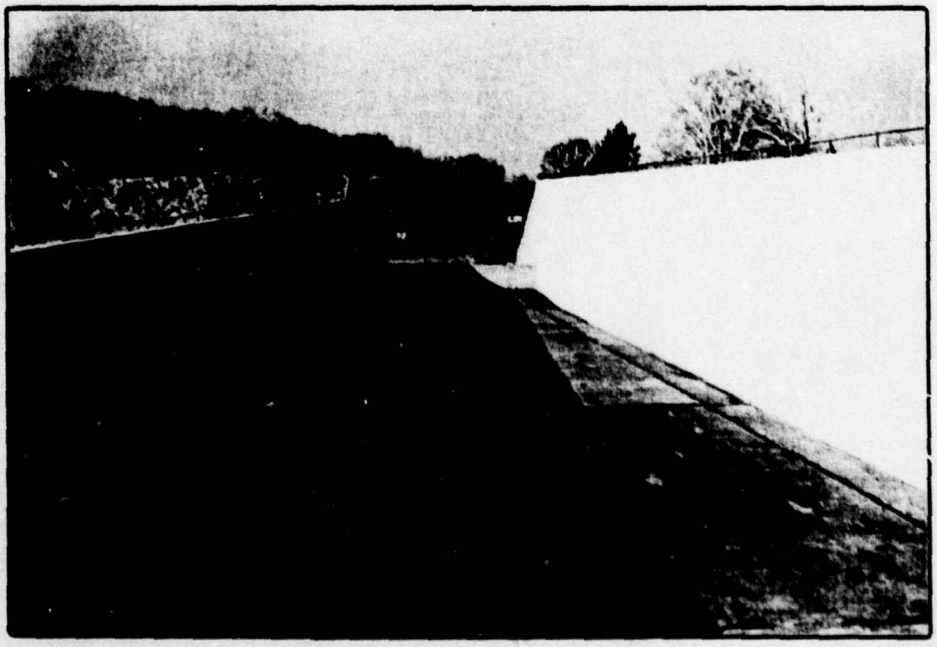


PHOTO 8. Close-up View of South End of Auxiliary Spillway

APPENDIX D

HYDROLOGIC AND HYDRAULIC COMPUTATIONS

MICHAEL BAKER, JR., INC.
THE BAKER ENGINEERS

Box 280
Beaver, Pa. 15009

Subject Meadville Dam S.O. No.

Sheet No. of

Drawing No.

Computed by Checked by Date

Table of Contents

PREFACE

HYDROLOGIC AND HYDRAULIC COMPUTATIONS

The hydrologic determinations presented in this Phase I Inspection Report are based on the use of a Snyder's unit hydrograph developed by the U.S. Army Corps of Engineers. Due to the limited number of gaging stations available in this hydrologic region and the wide variation of watershed slopes, the Snyder's coefficients may yield results of limited accuracy for this watershed. As directed however, a further refinement of these coefficients is beyond the scope of this Phase I Investigation.

In addition, the conclusions presented pertain to present conditions, and the effect of future development on the hydrology has not been considered.

MICHAEL BAKER, JR., INC.
THE BAKER ENGINEERS

Box 280
Beaver, Pa. 15009

Subject Meadville Dam — S.O. No.
Rainfall and Hydrograph Data — Sheet No. 1 of 20
Uncontrolled Drainage Area — Drawing No.
Computed by G.G.S. Checked by REH Date 3-2-79

Rainfall from HMR-33

PMP 24hr-200mi² = 23.4 in

D.A. = 297.9 mi² located in Zone 2 (Uncontrolled Drainage Area)

P 6hr = 117% PMP
P 12hr = 131% PMP
P 24hr = 141% PMP
P 48hr = 151% PMP

Hydrograph located in Zone 23 (Ohio River Basin)

$t_p = 3.3(L L_{ca})^{0.3}$ $C_p = 0.55$

$t_R = 20$ min.

L = 3.03 mi

L_{ca} = 1.91 mi

$t_p = 3.3(L L_{ca})^{0.3}$

$= 3.3(3.03 \times 1.91)^{0.3}$

$= 5.59$ hrs

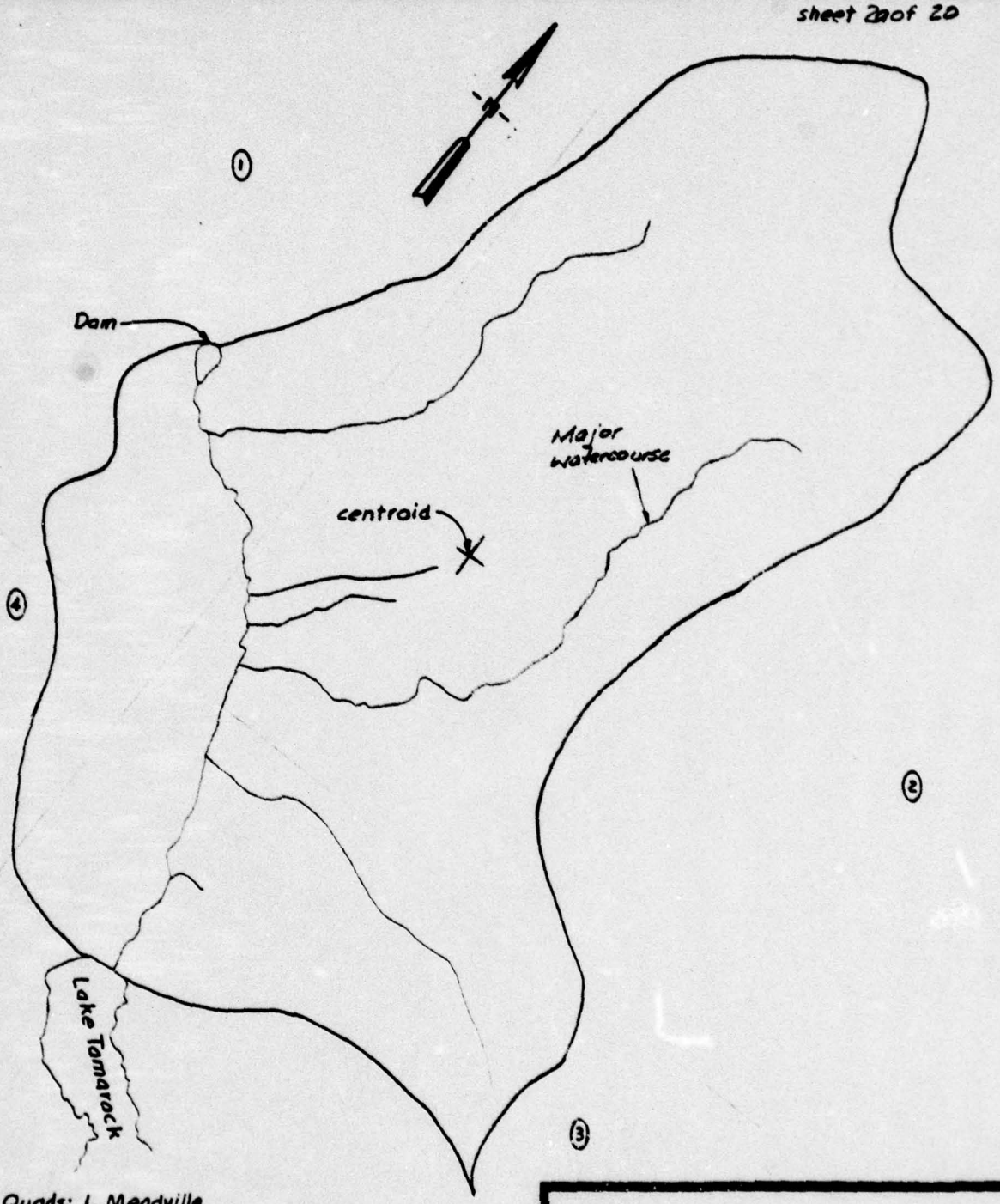
$t_r = t_p / 5.5$

$= 1.02$ hrs

$t_{pr} = t_p + 0.25(t_R - t_r)$

$= 5.59 + 0.25(\frac{20}{60} - 1.02)$

$= 5.42$ hrs



Quads: 1. Meadville
2. Blooming Valley
3. Cochranton
4. Geneva

Drainage Area = 2.97 mi.²
L = 3.03 mi. Lca = 1.91 mi.

0 2000 4000
SCALE IN FEET

DATE: 3-29-79

Mill Run Watershed at Meadville Dam

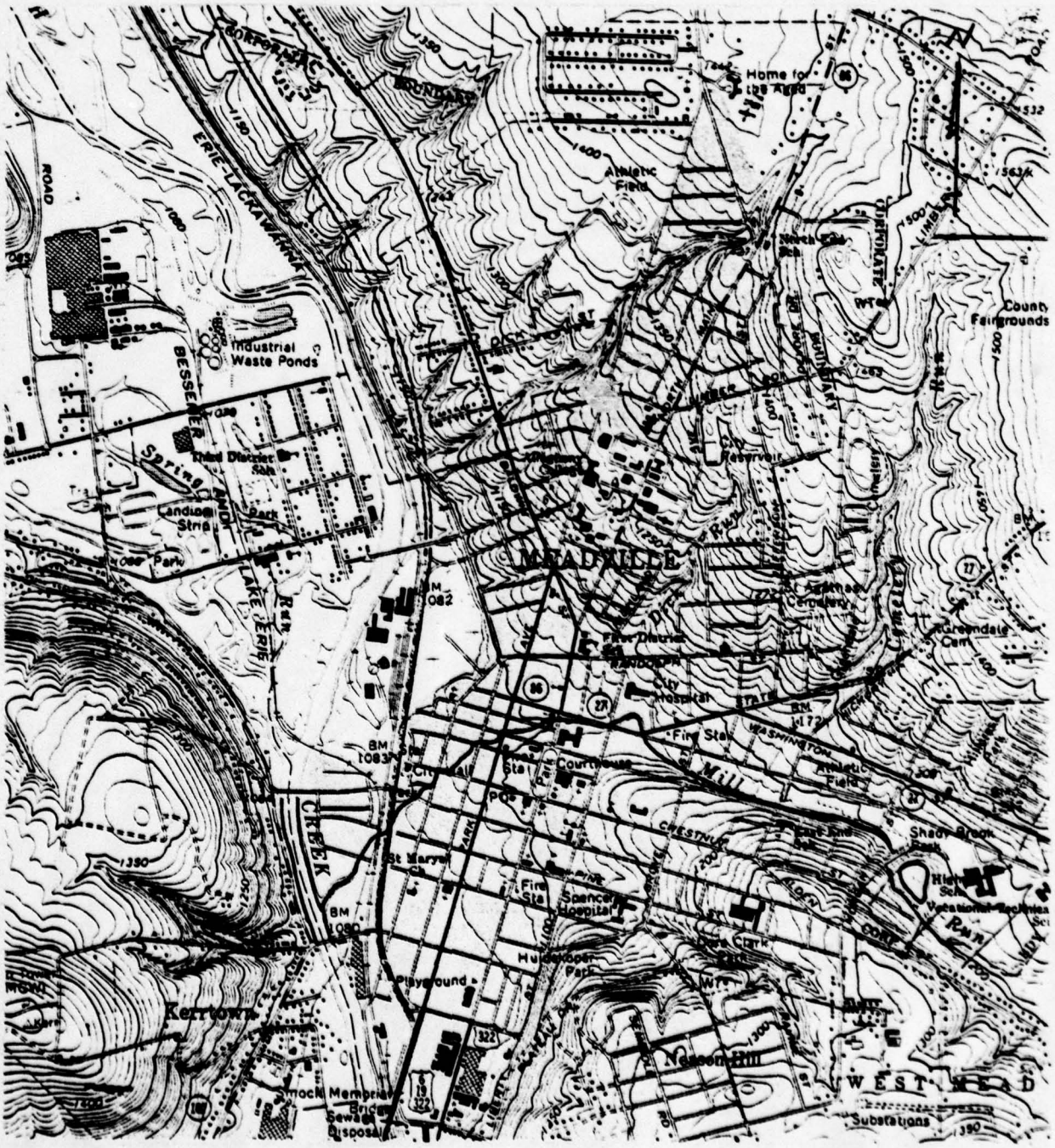
MICHAEL BAKER JR. INC.
Consulting Engineers & Surveyors

MICHAEL BAKER, JR., INC.
THE BAKER ENGINEERS

Box 280
Beaver, Pa. 15009

Subject Meadville Dam
Downstream Area Map

S.O. No.
Sheet No. 2b of 20
Drawing No.
Computed by REH Checked by Date 4-25-79



2000 0 2000 4000
Scale in feet

MICHAEL BAKER, JR., INC.
THE BAKER ENGINEERS

Box 280
Beaver, Pa. 15009

Subject Meadville Dam — S.O. No. ____
Principal Spillway Rating — Sheet No. 3 of 20
Drawing No. ____
Computed by g.a.s. — Checked by REH — Date ____

Weir flow: (Q_W)

$Q_W = CLH^{3/2}$

$Q_W = 3.1(10)H^{3/2}$

$Q_W = 49.6H^{3/2}$

Pipe flow: (Q_P)

From figure B-10
Design of Small Dams

L = 111 ft.

K_e = 0.5

D = 42 in.

Elev. (ft.)	h_w (ft.)	Q_W (cfs)	h_p (ft.)	Q_P (cfs)
1164	0.5	18	14	185
1165	1.5	91	15	190
1166	2.5	196	16	196
1167	3.5	325	17	202
1168	4.5	473	18	208
1169			19	214
1170			20	220
1171			21	226
1172			22	232
1173			23	238
1174			24	244
1175			25	250
1176			26	255
1177			27	260
1178			28	265
1179			29	270
1180			30	275
1181			31	278
1182			32	281
1183			33	283
1184			34	285
1189			39	310

MICHAEL BAKER, JR., INC.
THE BAKER ENGINEERS

Box 280
Beaver, Pa. 15009

Subject Meadville Dam — S.O. No.
Stage vs. Discharge — Sheet No. 4 of 20
Drawing No.
Computed by G.A.S. — Checked by REH — Date 3-7-79

Stage (feet)	Q_{weir} (c.f.s.)	Q_{pipe} (cfs)	Q_{EMS}* (cfs)	Q_{TOTAL} (cfs)
1162	78	186		18
1163	91	190		91
1166	196	196		196
1167	325	202		202
1168	473	206		206
1169		214		214
1170		220		220
1171		226		226
1172		232		232
1173		238		238
1174		244		244
1175		250		250
1176		255		255
1177		260		260
1178		265		265
1179		270		270
1180		275		275
1181		278		278
1182		281		281
1183		283		283
1184		285		285
1184.3		286		286
1184.5		288	72	360
1184.8		289	286	575
1185.2		292	810	1102
1185.8		294	1491	1785

MICHAEL BAKER, JR., INC.
THE BAKER ENGINEERS

Box 280
Beaver, Pa. 15009

Subject Meadville Dam
Stage vs. Discharge

S.O. No.
Sheet No. 5 of 20
Drawing No.
Computed by Q.Q.S. Checked by REH Date 3-7-79

Stage	Q_{AREA}	Q_{PIPE}	Q_{EMS}*	Q_{TOTAL}
1186.3		297	2301	2598
1186.8		299	3223	3522
1187.3		302	4246	4548
1187.8		304	5363	5667
1188.3		307	6567	6874
1188.8		309	7854	8163
1189.3		312	9219	9531
1189.8		314	10661	10975
1190.3		317	12176	12493

*Q_{EMS} Emergency Spillway was taken from the SCS Design Report for Meadville Dam.

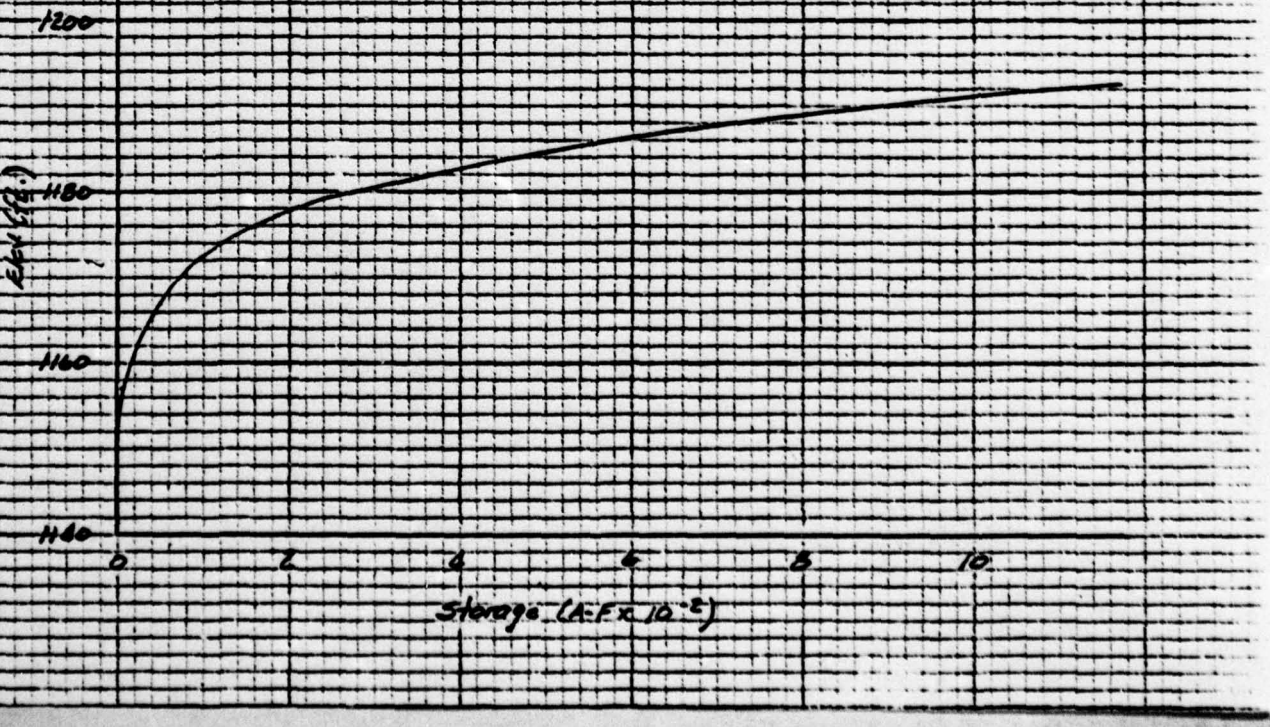
MICHAEL BAKER, JR., INC.
THE BAKER ENGINEERS

Box 280
Beaver, Pa. 15009

Subject Meadville Dam
Stage vs. Storage
(from SCS Design Report)

S.O. No. _____
Sheet No. 6 of 20
Drawing No. _____
Computed by G.A.S. Checked by RAH Date 9-6-79

Stage (Ft.)	Storage (A-F)
1151.0	0
1157.0	5.82
1162.0	21.12
1167.0	67.82
1172.0	91.62
1177.0	181.42
1182.0	261.32
1187.0	656.62
1192.0	1108.17

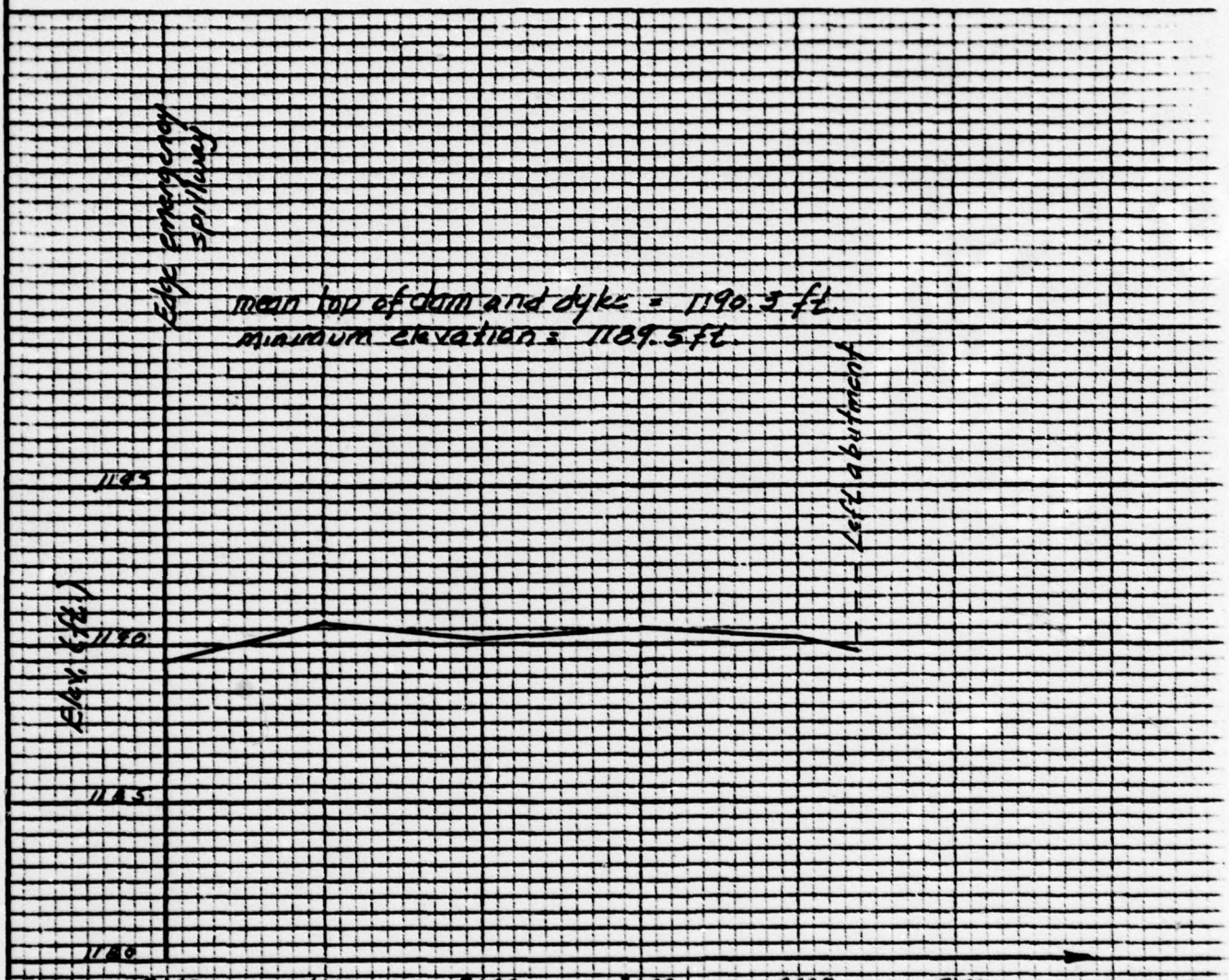


MICHAEL BAKER, JR., INC.
THE BAKER ENGINEERS

Box 280
Beaver, Pa. 15009

Subject Meadville Dam
Top of Dam Profile

S.O. No.
Sheet No. 7 of 20
Drawing No.
Computed by G.A.S. Checked by Date 3-7-79



Note: Crest of dyke is approximately the same elevation as the crest of dam. (low point on dyke = 1189.7)

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**********
FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION     JULY 1978
  LAST MODIFICATION  25 SEP 78
**********
```

1	A1	NATIONAL PROGRAM FOR INSPECTION OF NON-FEDERAL DAMS										
2	A2	HYDROLOGIC AND HYDRAULIC ANALYSIS OF TAMARACK LAKE A & B										
3	A3	PROBABLE MAXIMUM FLOOD PMF/UNIT GRAPH BY SNYDERS METHOD										
4	B	300	0	20	0	0	0	0	0	-4	0	
5	B1	5										
6	J	1	1	1								
7	J1	1.0										
8	K	0	1					1				
9	K1	HYDROGRAPH FOR OVERLAND FLOW										
10	M	1	1	4.99		4.99						
11	P		23.4	117	127	141	151					
12	T							1.0	0.05			
13	W	3.06	0.55									
14	X	-1.5	-0.05	2.0								
15	K	1	DAM					1				
16	K1	THIS IS A ROUTING FOR TAMARACK LAKE										
17	V				1	1						
18	Y1							-1216	-1			
19	Y4	1216	1217	1218	1219	1220	1220.90	1221.71	1222.57	1223.30	1223.91	
20	Y5	0	14	35	105	139	767	1933	3758	5592	7462	
21	$S	3850	4400	5000	5600	6200	6880	7530	8150	8700	9050	
22	$E	1216	1217	1218	1219	1220	1221	1222	1223	1224	1225	
23	$$	1216										
24	$D	1223	2.65	1.5	1800							
25	K	99										

Note: for additional information see the report for Tamarack Lake Dam A

Sheet 8 of 20

****
FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION JULY 1978
LAST MODIFICATION 25 SEP 78
****

RUN DATE 04/24/79
TIME 16.18

NATIONAL PROGRAM FOR INSPECTION OF NON-FEDERAL DAMS
HYDROLOGIC AND HYDRAULIC ANALYSIS OF TAMARACK LAKE A & B
PROBABLE MAXIMUM FLOOD PMF/UNIT GRAPH BY SNYDERS METHOD

JOB SPECIFICATION

NQ	NHR	NMIN	IDAY	IHR	IMIN	METRC	IPLT	IPRT	NSTAN
300	0	20	0	0	0	0	0	-4	0

JOPER	NWT	LROPT	TRACE
5	0	0	0

MULTI-PLAN ANALYSES TO BE PERFORMED
NPLAN= 1 NRTIO= 1 LRTIO= 1

RTIOS= 1.00

********** ********** ********** ********** **********

SUB-AREA RUNOFF COMPUTATION

HYDROGRAPH FOR OVERLAND FLOW

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
1	0	0	0	0	0	1	0	0

HYDROGRAPH DATA

IHYDG	IUHG	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISNOW	ISAME	LOCAL
1	1	4.99	0.0	4.99	0.0	0.0	0	0	0

PRECIP DATA

SPFE	PMS	R6	R12	R24	R48	R72	R96
0.0	23.40	117.00	127.00	141.00	151.00	0.0	0.0

TRSPC COMPUTED BY THE PROGRAM IS 0.800

LOSS DATA

LROPT	STRKR	DLTKR	RTIOL	ERAIN	STRKS	RTIOK	STRTL	CNSTL	ALSMX	RTIMP
0	0.0	0.0	1.00	0.0	0.0	1.00	1.00	0.05	0.0	0.0

UNIT HYDROGRAPH DATA
TP= 3.06 CP=0.55 NTA= 0

RECESSION DATA
STRTQ= -1.50 QRCSN= -0.05 RTIOR= 2.00

UNIT HYDROGRAPH 62 END-OF-PERIOD ORDINATES, LAG= 3.08 HOURS, CP= 0.55 VOL= 1.00

19.	72.	145.	231.	325.	418.	496.	551.	584.	588.
556.	506.	461.	420.	382.	348.	317.	289.	263.	240.
218.	199.	181.	165.	150.	137.	124.	113.	103.	94.
86.	78.	71.	65.	59.	54.	49.	44.	41.	37.
34.	31.	28.	25.	23.	21.	19.	17.	16.	14.

Sheet 9 of 20

13. 12. 11. 10. 9. 8. 8. 7. 6. 6.
5. 5.

MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	END-OF-PERIOD FLOW COMP Q	MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q
									SUM	28.27	25.83	2.44	251211.
										(718.)(	656.)(	62.)(	7113.51)

********** ********** ********** ********** **********

HYDROGRAPH ROUTING

THIS IS A ROUTING FOR TAMARACK LAKE

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
DAM	1	0	0	0	0	1	0	0

ROUTING DATA

QLOSS	CLOSS	AVG	IRES	ISAME	IOPT	IPMP	LSTR
0.0	0.0	0.0	1	1	0	0	0

NSTPS	NSTOL	LAG	AMSKK	X	TSK	STORA	ISPRAT
0	0	0	0.0	0.0	0.0	-1216.	-10

STAGE	1216.00	1217.00	1218.00	1219.00	1220.00	1220.90	1221.71	1222.57	1223.30	1223.91
FLOW	0.0	14.00	35.00	105.00	139.00	767.00	1933.00	3758.00	5592.00	7462.00
CAPACITY=	3850.	4400.	5000.	5600.	6200.	6880.	7530.	8150.	8700.	9050.
ELEVATION=	1216.	1217.	1218.	1219.	1220.	1221.	1222.	1223.	1224.	1225.

CREL	SPWID	COQW	EXPW	ELEVL	COQL	CAREA	EXPL
1216.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

DAM DATA

TOPEL	COQD	EXPD	DAMWID
1223.0	2.6	1.5	1800.

PEAK OUTFLOW IS 4609. AT TIME 46.67 HOURS

********** ********** ********** ********** **********

Sheet 10 of 20

PEAK FLOW AND STORAGE (END OF PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
FLOWS IN CUBIC FEET PER SECOND (CUBIC METERS PER SECOND)
AREA IN SQUARE MILES (SQUARE KILOMETERS)

OPERATION	STATION	AREA	PLAN	RATIO APPLIED TO FLOWS RATIO 1 1.00
HYDROGRAPH AT	1	4.99 (12.92)	1	9970. (282.55)(
ROUTED TO	DAM	4.99 (12.92)	1	4609. (130.52)(

Sheet 11 of 20

SUMMARY OF DAM SAFETY ANALYSIS

PLAN 1 .....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	1216.00	1216.00	1223.00
STORAGE	3850.	3850.	8150.
OUTFLOW	0.	0.	4839.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
1.00	1222.91	0.0	8093.	4609.	0.0	46.67	0.0

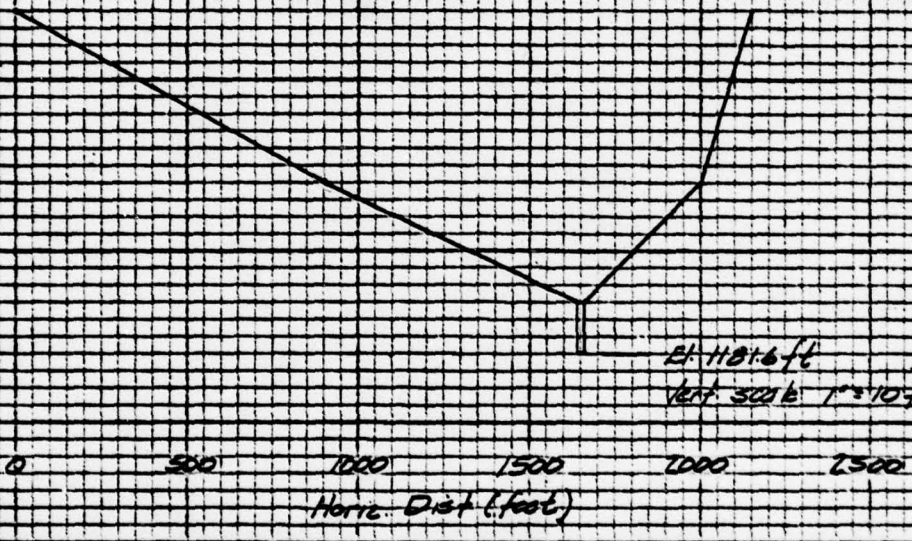
Sheet 12 of 20

MICHAEL BAKER, JR., INC.
THE BAKER ENGINEERS

Box 280
Beaver, Pa. 15009

Subject Meadville Dam — S.O. No.
Channel Routing Data — Sheet No. 13 of 20
Drawing No.
Computed by G.A.S. Checked by REH Date 3-7-79

Typical Cross-section used in Channel Routing Analysis



The outflow from Tamarack Dam A was routed 3500 feet downstream to the flood pool created by Meadville Dam. Parameters used in the routing are:

slope of channel = 0.003
channel roughness (n) = 0.04
overbank roughness = 0.08

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**********
FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION      JULY 1978
  LAST MODIFICATION  25 SEP 78
**********
     1              A1       NATIONAL PROGRAM FOR INSPECTION OF NON-FEDERAL DAMS
     2              A2       HYDROLOGIC AND HYDRAULIC ANALYSIS OF MEADVILLE DAM MBJ  01
     3              A3       PROBABLE MAXIMUM FLOOD PMF/UNIT GRAPH BY SNYDERS METHOD
     4              B   300      0      20       0       0       0       0       0      -4       0
     5              B1    5
     6              J     1      1       1
     7              J1  1.0
     8              K     0      4                                       1
     9              K1           DISCHARGE FROM TAMARACK LAKE DAM A  (See note on following page)
    10              M    -1             4.99
    11              N
    12              N
    13              N
    14              N
    15              N
    16              N                                    0       0       0       0       0       1       1
    17              N     1      1       1       1       1       1       1       1       1       1       1
    18              N     1      1       1       1       2       2       2       2       2       2       2
    19              N     2      2       2       2       2       2       2       2       2       2       3
    20              N     3      3       3       3       3       3       3       3       4       4       4
    21              N     4      4       4       4       5       5       5       5       6       6       6
    22              N     6      6       6       7       7       7       8       8       9      10
    23              N    12     15      18      23      35      46     135     285     440     720
    24              N  1063   1412    1706    1948    2146    2318    2440    2521    2565    2589
    25              N  2573   2546    2504    2449    2385    2313    2237    2155    2076    2003
    26              N  1926   1849    1770    1691    1611    1532    1454    1380    1309    1240
    27              N  1173   1108    1057    1015     973     933     893     855     818     782
    28              N   748    715     683     652     622     594     567     531     506     483
    29              N   386    386     386     386     330     330     330     330     330     285
    30              N   285    285     285     245     245     245     245     245     205     205
    31              N   205    205     205     205     167     167     167     167     167     167
    32              N   135    135     135     135     135     135     135     102     102     102
    33              N   102    102     102     102     102     102     102      75      75      75
    34              N    75     75      75      75      75      75      75      75      75      49
    35              N    49     49      49      49      49      49      49      49      49      49
    36              N    49     49      49      49      45      45      45      45      45      45
    37              N    45     45      45      45      45      45      45      45      45      45
    38              N    42     42      42      42      42      42      42      42      42      42
    39              N    42     42      42      42      42      42      42      40      40      40
    40              N    40     40      40      40      40      40      40      40      40      40
    41              K     1      5                                       1
    42              K1           CHANNEL ROUTING LAKE TAMARACK TO MEADVILLE DAM  MOD PULS
    43              Y                                    1       1
    44              Y1    1
    45              Y6  0.08    0.04    0.08  1181.6  1189.0    5500    .003
    46              Y7   0.0  1201.6   900.0  1191.6  1640.0  1184.6  1640.0  1181.6  1660.0  1181.6
    47              Y71660.0  1183.6  2000.0  1191.6  2150.0  1201.0
    48              K     0      6                                       1
    49              K1           SNYDER HYDROGRAPH FOR UNCONTROLLED RUNOFF TO MEADEVILLE DAM
    50              M     1      1      2.97
```

Sheet 14 of 20

```
51          P          23.4     117      127      141      151
52          T                                                    1.0     0.05
53          W   5.42   0.55
54          X   -1.5   -0.05    2.0
55          K      2       7                                     1
56          K1         HYDROGRAPH FOR DISCHARGE LAKE TAMARACK AND UNCONTROLLED RUNOFF
57          K      1   DAM                                       1
58          K1         THIS IS A ROUTING FOR MEADEVILLE DAM
59          Y                                    1        1
60          Y1                                                   -1163.5      -1
61          Y41163.5    1165     1167     1169     1171     1173     1175     1177     1179     1181
62          Y4  1183 1184.3   1185.3   1186.3   1187.3   1188.3   1189.3   1190.3
63          Y5     0      91      202      214      226      238      250      260      270      278
64          Y5   283     286     1102     2598     4548     6874     9531    12493
65          $S     0    5.82    21.12    47.82    91.82   181.42   361.52   656.62  1108.17
66          $E  1151    1157     1162     1167     1172     1177     1182     1187     1192
67          $$1163.5
68          $D1190.3    2.65      1.5     1436
69          K      99
```

Note: The inflow hydrograph input on the previous page repcesents the outflow from Tamarack Lake-Dam A. This hydrograph represents approximately 56% of the total outflow from Tamarack Lake. It was developed by routing the design flood through Tamarack Lake (pages B-12 of this appendix) and then calculating the corresponding discharges from Dam A by using the discharge rating developed by the SCS.

****
FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION JULY 1978
LAST MODIFICATION 25 SEP 78
****

RUN DATE 04/24/79
TIME 14.11

NATIONAL PROGRAM FOR INSPECTION OF NON-FEDERAL DAMS
HYDROLOGIC AND HYDRAULIC ANALYSIS OF MEADVILLE DAM NBJ 01
PROBABLE MAXIMUM FLOOD PMF/UNIT GRAPH BY SNYDERS METHOD

JOB SPECIFICATION

NQ	NHR	NMIN	IDAY	IHR	IMIN	METRC	IPLT	IPRT	NSTAN
300	0	20	0	0	0	0	0	-4	0

JOPER	NWT	LROPT	TRACE
5	0	0	0

MULTI-PLAN ANALYSES TO BE PERFORMED
NPLAN= 1 NRTIO= 1 LRTIO= 1

RTIOS= 1.00

****

SUB-AREA RUNOFF COMPUTATION

DISCHARGE FROM TAMARACK LAKE DAM A

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
4	0	0	0	0	0	1	0	0

HYDROGRAPH DATA

IHYDG	IUHG	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISNOW	ISAME	LOCAL
-1	0	4.99	0.0	4.99	0.0	0.0	0	0	0

****

HYDROGRAPH ROUTING

CHANNEL ROUTING LAKE TAMARACK TO MEADVILLE DAM MOD PULS

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
5	1	0	0	0	0	1	0	0

ROUTING DATA

QLOSS	CLOSS	AVG	IRES	ISAME	IOPT	IPMP	LSTR
0.0	0.0	0.0	1	1	0	0	0

NSTPS	NSTDL	LAG	AMSKK	X	TSK	STORA	ISPRAT
1	0	0	0.0	0.0	0.0	0.	0

NORMAL DEPTH CHANNEL ROUTING

Sheet 16 of 20

QN(1)	QN(2)	QN(3)	FLNVT	ELMAX	RLNTH	SEL
0.0800	0.0400	0.0800	1181.6	1189.0	5500.	0.00300

CROSS SECTION COORDINATES--STA,ELEV,STA,ELEV--ETC
0.0 1201.60 900.00 1191.60 1640.00 1184.60 1640.00 1181.60 1660.00 1181.60
1660.00 1183.60 2000.00 1191.60 2150.00 1201.00

STORAGE	0.0	0.98	1.97	2.95	3.93	4.92	6.20	8.30	11.29	16.62
	24.79	35.80	49.64	66.33	85.85	108.20	133.40	161.43	192.30	226.01
OUTFLOW	0.0	8.26	25.59	49.12	77.55	110.03	148.03	194.23	252.03	330.42
	439.11	586.81	781.10	1028.87	1336.56	1710.23	2155.66	2678.38	3283.74	3976.89
STAGE	1181.60	1181.99	1182.38	1182.77	1183.16	1183.55	1183.94	1184.33	1184.72	1185.10
	1185.49	1185.88	1186.27	1186.66	1187.05	1187.44	1187.83	1188.22	1188.61	1189.00
FLOW	0.0	8.26	25.59	49.12	77.55	110.03	148.03	194.23	252.03	330.42
	439.11	586.81	781.10	1028.87	1336.56	1710.23	2155.66	2678.38	3283.74	3976.89

MAXIMUM STAGE IS 1188.1

********** ********** ********** ********** **********

SUB-AREA RUNOFF COMPUTATION

SNYDER HYDROGRAPH FOR UNCONTROLLED RUNOFF TO MEADEVILLE DAM

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
6	0	0	0	0	0	1	0	0

HYDROGRAPH DATA

IHYDG	IUHG	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISNOW	ISAME	LOCAL
1	1	2.97	0.0	2.97	0.0	0.0	0	0	0

PRECIP DATA

SPFE	PMS	R6	R12	R24	R48	R72	R96
0.0	23.40	117.00	127.00	141.00	151.00	0.0	0.0

TRSPC COMPUTED BY THE PROGRAM IS 0.800

LOSS DATA

LROPT	STRKR	DLTKR	RTIOL	ERAIN	STRKS	RTIOK	STRTL	CNSTL	ALSMX	RTIMP
0	0.0	0.0	1.00	0.0	0.0	1.00	1.00	0.05	0.0	0.0

UNIT HYDROGRAPH DATA
TP= 5.42 CP=0.55 NTA= 0

RECESSION DATA
STRTQ= -1.50 QRCSN= -0.05 RTIOR= 2.00

UNIT HYDROGRAPH100 END-OF-PERIOD ORDINATES, LAG= 5.44 HOURS, CP= 0.55 VOL= 0.99

3.	11.	23.	36.	52.	69.	87.	105.	124.	143.
159.	172.	183.	192.	198.	200.	199.	193.	183.	174.
165.	157.	149.	141.	134.	127.	121.	114.	109.	103.
98.	93.	88.	84.	79.	75.	72.	68.	64.	61.
58.	55.	52.	50.	47.	45.	42.	40.	38.	36.
34.	33.	31.	29.	28.	26.	25.	24.	23.	21.
20.	19.	18.	17.	17.	16.	15.	14.	13.	13.
12.	11.	11.	10.	10.	9.	9.	8.	8.	8.
7.	7.	6.	6.	6.	6.	5.	5.	5.	4.
4.	4.	4.	4.	3.	3.	3.	3.	3.	3.

Sheet 17 of 29

Q MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q	END-OF-PERIOD FLOW MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q
									SUM	28.27	25.83	2.44	147813.
										(718.)(	656.)(	62.)(	4185.60)

********** ********** ********** ********** **********

COMBINE HYDROGRAPHS

HYDROGRAPH FOR DISCHARGE LAKE TAMARACK AND UNCONTROLLED RUNOFF

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
7	2	0	0	0	0	1	0	0

********** ********** ********** ********** **********

HYDROGRAPH ROUTING

THIS IS A ROUTING FOR MEADEVILLE DAM

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
DAM	1	0	0	0	0	1	0	0

ROUTING DATA

QLOSS	CLOSS	AVG	IRES	ISAME	IOPT	IPMP	LSTR
0.0	0.0	0.0	1	1	0	0	0

NSTPS	NSTDL	LAG	AMSKK	X	TSK	STORA	ISPRAT
0	0	0	0.0	0.0	0.0	-1164.	-1

STAGE	1163.50	1165.00	1167.00	1169.00	1171.00	1173.00	1175.00	1177.00	1179.00	1181.00
	1183.00	1184.30	1185.30	1186.30	1187.30	1188.30	1189.30	1190.30		
FLOW	0.0	91.00	202.00	214.00	226.00	238.00	250.00	260.00	270.00	278.00
	283.00	286.00	1102.00	2598.00	4548.00	6874.00	9531.00	12493.00		
CAPACITY=	0.	6.	21.	48.	92.	181.	362.	657.	1108.	
ELEVATION=	1151.	1157.	1162.	1167.	1172.	1177.	1182.	1187.	1192.	

CREL	SPWID	COQW	EXPW	ELEVL	COQL	CAREA	EXPL
1163.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0

DAM DATA

TOPEL	COQD	EXPD	DAMWID
1190.3	2.6	1.5	1436.

PEAK OUTFLOW IS 5892. AT TIME 46.67 HOURS

********** ********** ********** ********** **********

Sheet 18 of 20

PEAK FLOW AND STORAGE (END OF PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
FLOWS IN CUBIC FEET PER SECOND (CUBIC METERS PER SECOND)
AREA IN SQUARE MILES (SQUARE KILOMETERS)

OPERATION	STATION	AREA	PLAN	RATIOS APPLIED TO FLOWS RATIO 1 1.00
HYDROGRAPH AT	4	4.99 (12.92)	1	2589. (73.31)(
ROUTED TO	5	4.99 (12.92)	1	2525. (71.49)(
HYDROGRAPH AT	6	2.97 (7.69)	1	4001. (113.31)(
2 COMBINED	7	7.96 (20.62)	1	5943. (168.29)(
ROUTED TO	DAM	7.96 (20.62)	1	5892. (166.85)(

PLAN 1 STATION 5

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
1.00	2525.	1188.1	47.67

Sheet 19 of 20

SUMMARY OF DAM SAFETY ANALYSIS

PLAN 1 .....

	INITIAL VALUE	SPILLWAY CREST	AVERAGE TOP OF DAM
ELEVATION	1163.50	1163.50	1190.30
STORAGE	29.	29.	955.
OUTFLOW	0.	0.	12493.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	AVERAGE ~~MAXIMUM~~ DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
1.00	1187.88	0.0	736.	5892.	0.0	46.67	0.0

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APPENDIX E

REGIONAL GEOLOGY

MEADVILLE DAM
NDI No. PA 00177, PennDER No. 20-48, SCS No. PA 460

REGIONAL GEOLOGY

Meadville Dam is located in the glaciated section of the Appalachian Plateaus physiographic province. Geologic references indicate that Mill Run, the site of the dam, and much of the city of Meadville are located on Wisconsin stage glacial outwash deposits. Test borings made to obtain subsurface information for design of the dam penetrated interbedded deposits of sand and gravel, sand, and some silt mixed with varying amounts of clay. Some of these borings were drilled as deep as 31 feet without penetrating bedrock. However, geologic references show that bedrock units beneath the glacial deposits are gently dipping members of the Pocono group, Mississippi system as shown on the following map and legend. These units are predominantly gray, hard massive conglomerates and sandstones with some shale.

GEOLOGIC MAP
Meadville Dam
NDI No. PA 00177 Crawford County

Reproduced from Geologic Map of Pennsylvania, Pennsylvania Geological Survey, 4th Series

Scale: One Inch Equals Approximately Four Miles
See Legend, Next page

LEGEND

PERMIAN

Greene Formation

Cyclic sequences of sandstone, shale, red beds, limestone and coal; base at the top of the Upper Washington Limestone.

PERMIAN AND PENNSYLVANIAN

Washington Formation

Cyclic sequences of sandstone, shale, limestone and coal; some red shale; some mineable coal; base at the top of the Waynesburg Coal.

PENNSYLVANIAN

APPALACHIAN PLATEAU

Monongahela Formation

Cyclic sequences of sandstone, shale, limestone and coal; limestone prominent in northern outcrop areas; shale and sandstone increase southward; commercial coals present; base at the bottom of the Pittsburgh Coal.

Pc

Conemaugh Formation

Cyclic sequences of red and gray shales and siltstones with thin limestones and coals; massive Mahoning Sandstone commonly present at base; Ames Limestone present in middle of sections; Brush Creek Limestone in lower part of section.

Allegheny Group

Cyclic sequences of sandstone, shale, limestone and coal; numerous commercial coals; limestones thicken westward; Vanport Limestone in lower part of section; includes Freeport, Kittanning, and Clarion Formations.

Pottsville Group

Predominantly sandstones and conglomerates with thin shales and coals; some coals mineable locally.

ANTHRACITE REGION

Ppv

Post-Pottsville Formations

Brown or gray sandstones and shales with some conglomerate and numerous mineable coals.

Pottsville Group

Light gray to white, coarse grained sandstones and conglomerates with some mineable coal; includes Sharp Mountain, Schuylkill, and Tumbling Run Formations.

MISSISSIPPIAN

Mauch Chunk Formation

Red shales with brown to greenish gray flaggy sandstones; includes Greenbrier Limestone in Fayette, Westmoreland, and Somerset counties; Loyalhanna Limestone at the base in southwestern Pennsylvania.

Pocono Group

Predominantly gray, hard, massive, cross-bedded conglomerate and sandstone with some shale; includes in the Appalachian Plateau Burgoon, Shenango, Cuyahoga, Cussewago, Corry, and Knapp Formations; includes part of "Oswayo" of M. L. Fuller in Potter and Tioga counties.

DEVONIAN

UPPER

WESTERN PENNSYLVANIA

Oswayo Formation

Greenish gray to gray shales, siltstones and sandstones becoming increasingly shaly westward; considered equivalent to type Oswayo. Riceville Formation Cr in Erie and Crawford Counties; probably not distinguishable north of Corry.

Dcr

Cattaraugus Formation

Red, gray and brown shale and sandstone with the proportion of red decreasing westward; includes Venango sands of drillers and Salamanca sandstone and conglomerate; some limestone in Crawford and Erie counties.

Conneaut Group

Alternating gray, brown, greenish and purplish shales and siltstones; includes "pink rock" of drillers and "Chemung" and "Girard" Formations of northwestern Pennsylvania.

Canadaway Formation

Alternating brown shales and sandstones; includes "Portage" Formation of northwestern Pennsylvania.

END 9-79